SCIENTIFIC AMERICAN

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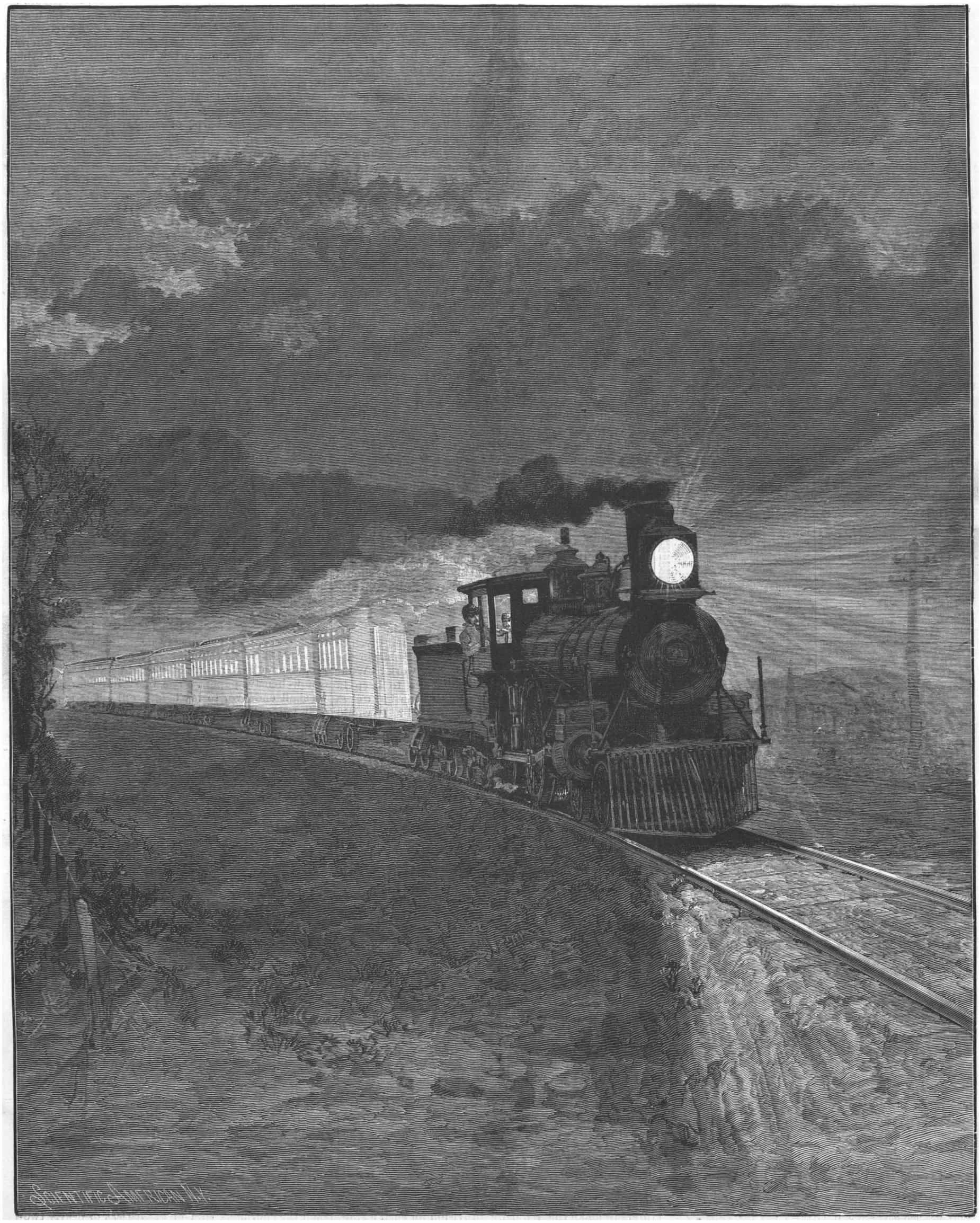

THE NEW "GHOST" EXPRESS TRAIN BETWEEN NEW YORK AND BOSTON.—[See page 229 |

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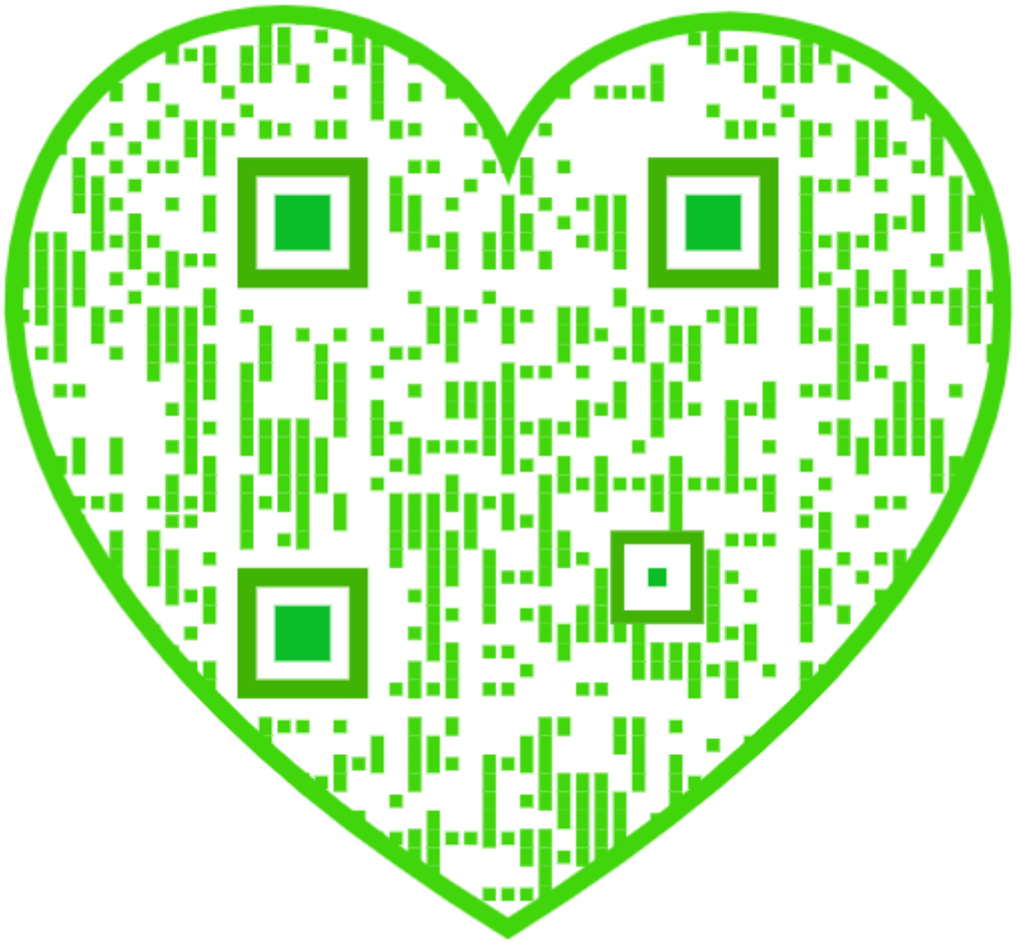

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THE REDUCTION OF PATENT FEES.

The patent system of this country was established "to promote the progress of useful arts," as set forth in the title of the creative act of April 10, 1790. This wise purpose has been most grandly accomplished, and we have become a nation of inventors. It was probably no part of the original design that this system should be a source of revenue to the general government, yet so greatly has the business of the Patent Office been extended that we are officially informed in the last report of the Commissioner of Patents that there was on January 1, 1891, the sum of $3,872,745.24 in the treasury of the United States which had been received from the Patent Office in excess of its running expenses, and that the excess for the single year of 1890 was $241,074.92. This surplus has been taken from the pockets of inventors for fees. Every inventor pays a first fee of $15 when he makes an application for a patent, and a final fee of $20 before his patent can issue. Now, while this large surplus may be proof of the prosperity of the Patent Office, it is also proof that inventors are paying more in fees than is necessary for the support of the system as at present managed, and more than is necessary to accomplish the design of its institution. Of course, the cheaper patents can be obtained, the greater the number that will be applied for, and the more will the inventive business of the country be stimulated, and the greater will be "the progress of useful arts." That the present tariff of fees is too high seems to be proved by the report already mentioned, in which it is stated that the number of patents withheld for non-payment of final fees during the year 1890 was 3,559. In other words, 3,559 inventors who had paid their first fees of $15 each, or $53,385 in the aggregate, after their applications had been granted failed to pay their final fees, and forfeited their patents and the money already paid. How many were too poor to pay cannot be told, probably a large proportion. The number of patents issued in 1890 for inventions, exclusive of designs and reissues, was 25,284. If a reduction of $10 in each of these final fees had been made, the total reduction would have been $252,840, or a little more than the surplus for that year, and it is probable that if such a reduction had been made, enough more of the final fees that were forfeited would have been paid to have more than made up the deficiency. From this *resume*, believed to be a correct statement of the facts, it seems evident that a reduction of $10 might safely be made in the fees in each case of obtaining a patent, that it would be a boon to the inventor, and would "promote the progress of useful arts."

BUILD UP THE NAVY.

In 1886 the House Naval Committee were of the opinion and recommended that the government should at least create a navy that would be of respectable size and that it should demonstrate its capacity to increase rapidly to any required extent.

In what manner can such proposed rapid increase be provided if substantial encouragement be not given to our manufacturers to enable them to maintain the most improved modern plant for such work? What incentive will these manufacturers have to keep in hand the mechanism for this magic expansion unless appropriations are continuous and liberal? It would be impossible to exercise too great impartiality in the recognition of those who risk their wealth and reputation in the vast undertakings thus far so inadequately provided for.

The silver men are so eager for the success of legislation that will guarantee a market for their mines, and the farmers are so clamorous for the political control which they believe will secure for them an outlet for their produce, that they cannot pause long enough to realize that a liberal naval policy will, by the aid of its insurance and mechanical education, assure an increase of the output of the mines of the one and the more rapid and secure transit of their grain for the other. These and other important advantages would be attained by a policy of generous appropriations for increasing the strength of our navy.

Since 1861, when a wooden ship could be built and armed with iron smooth-bore guns in *three* months, thirty years have passed, during which time the most prominent European powers have adopted and developed the models, suggestions, and conceptions that were the direct fruit of our civil war, and which have produced radical alterations and transformations in vessels of war.

As many years are now required as months formerly to build and arm a modern battle ship. What folly, therefore, to talk of creating a navy in an emergency.

If we are to have a navy at all, let us have one that can whip the enemy if we must fight, and one that will be a school of the highest form of mechanical education if we shall be blessed with peace.

The country's naval strength cannot be reached and maintained by impetuous and spasmodic effort; it can only result from a well determined programme of such magnitude and duration as will induce our manufacturers to make the requisite provision for such a supply as will secure and reward their best efforts.

What is needed is a legislative encouragement that will secure for the nation the ripest fruit of our ablest mechanical minds, ready and willing to acquire and impart the education that such a policy must entail. Congress encourages medical development, agricultural development, makes special legislation for mining and opens the treasury for thousands of measures of greater or less importance; why not give equal stimulus to the new industries that have become so necessary and prominent a factor in the development of our new navy?

Whether these expenditures are needed from the standpoint of insurance, for "no man objects to paying money to have his house insured against fire, though he never expects it to be burned, nor should he object to the slight tax necessary to insure his house, his business, his country, against the transgressions or the possible transgressions of an enemy," or whether from the standpoint of avoiding temptation, for "there is no greater temptation to malevolents than an undefended people, a country with unprotected shores is an invitation to all the thieves and robbers of the world," or whether from the standpoint of education in the mechanical arts, to which we wish to give particular prominence, the work of protecting our nation, its people and its wealth, should go on vigorously and the requisite lines of naval and shore defense provided without delay. This done, and we shall be a nation anxious for peace, ready for war.

THE PATENT CENTENNIAL CELEBRATION.

The significance of the exercises connected with this celebration touches almost every department of human activity, and it is difficult to exaggerate the importance of their real meaning. Coming so gradually as we have to a realization of the vast results which have been but a natural outgrowth of the establishment of our patent system, one does not immediately perceive how great has been the actual progress, a conviction of which is most forcibly borne in upon the mind when it is remembered that it is only a hundred years ago that President George Washington signed the original law putting the patent system on a permanent basis. The present anniversary of this day is, therefore, fittingly marked in the programme of exercises for the week by an excursion to Mt. Vernon and an address on "Washington as an Inventor and Promoter of Improvements," while the programme for the evening of the same day includes a meeting presided over by the inventor who has given his name to the telephone. And the subjects of the papers of this evening—could they but be looked upon in the light which was vouchsafed our legislators of a hundred years ago—what would they not suggest of the marvelous and incredible? One of these papers of itself covers a wide scope, and touches upon many separate branches of inventive activity. It is entitled "The Relation of Invention to the Communication of Intelligence, and the Diffusion of Knowledge by Newspaper and Book." This rather Baconian title, however, wide as its scope, by no means trenches on the subjects of other speakers, as the literary feast provided by the programme has many other equally interesting and comprehensive papers. The most important of these we shall endeavor to lay before our readers, in whole or in part, at an early day.

Waves Caused by Explosions.

Methyl nitrate, CH_3NO_3, may give by explosion $CO_2 + CO + N_2 + 3H_2O$, or $2CO_2 + N_2 H_2 + 2H_2O$. In both cases the volume of the gas generated is the same, viz., 1,028 liters for 1 kilogramme, the heat of decomposition being 1,451 calories. These numbers are very nearly the same as those furnished by nitro-glycerine and gun cotton. The pressure developed when 1 kilogramme of methyl nitrate is exploded in a vessel of 1 liter capacity is no less than 11,000 kilogrammes per square centimeter. The author has attempted to measure the velocity of propagation of the waves, but the vessels employed were always broken by the shock. A calculation shows that the resistance offered by the vessels only increases with the thickness up to a certain limiting pressure. The pressure developed above this limit has infinite force. Hence nothing can resist it.—*M. Berthelot, Academy of Sciences, Paris.*

Sustaining Capacity of the Great Republic.

According to a recent census bulletin, the ratio of land and water surface is 98·16 and 1·84 per cent respectively. This bulletin also gives the area of the States and Territories by counties, and the classification of the latter by sizes. The average number of persons to each square mile of the land surface of the Union is 21·08.

As illustrative of the sustaining capacity of the United States, the bulletin says that if Texas, the largest State in the Union, was as thickly populated as the State of Rhode Island, it would have 83,523,628 inhabitants, while if the United States had a density of population equal to that of Rhode Island, the population of the Union, instead of being 62,622,250, would reach the enormous sum of 945,766,300, or nearly two-thirds of the present population of the world.

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The Barnum Institute of Science and History.

Those whose association of ideas with the name of P. T. Barnum are only of the street parade, canvas tent and hippodrome can hardly realize the fact that in Bridgeport, Conn., where his home has been for many years, people think of him mainly as a most kind-hearted gentleman and public-spirited benefactor. His gifts to the city are numerous and munificent, and he has recently crowned them all by purchasing an ample lot centrally located and beginning the erection of an elegant and spacious edifice which is his gift to the Scientific and Historical Societies of Bridgeport. More than a year ago he had informed those societies that he had remembered them in his will to the amount of $200,000; but his sensible conclusion has been to become, as far as possible, his own administrator, and hence the immediate erection of the building now briefly described. In style it will be purely Romanesque, with abundant ornamentation. At the angle of the streets there will be a grand dome, flanked by balconies. An historic frieze, with figures half life-size, will extend between the cornice of the dome and the top of the circular windows of the third story. Its five panels will set forth the various stages of the municipal career from colonial times down to the present day, and the medallions in the interspaces will be embellished by likenesses of eminent men. The material for the frieze will be terra cotta, and the intention is to make it a fine work of art. The upper parts of the dome and towers will be covered with copper, while the remainder will be tiled. At the apex of the dome there will be a gilded eagle. Back of the main dome will stand an observatory for astronomical purposes. The ground floor will be given up to stores, the rental from which will go to maintain the expenses of the building. The entrance to the Scientific and Historical rooms will be a gateway through the square tower on the right. The division between these rooms will be merely an open screen of arches and columns, so that free access can be had to any part of the floor, with the exception of a small hall intended for the use of the city medical society, and another room for business meetings. Under the observatory will be a fire-proof vault, in which may be stored specially precious relics and scientific specimens. The staircases and division walls are also to be fire-proof. In the third story will be a long hall lighted by sky lights, adapted for a picture gallery. A large room in the east wing will be devoted to exhibits of the two societies, while the auditorium for lectures will occupy the dome, but with sliding doors making the entire floor available when there may be occasion for so much space. The building material will be red sandstone, and the edifice will be a perfect model of its kind.

Site of the Chicago World's Fair.

President Lyman J. Gage, of the Chicago Board of Directors of the Columbian Fair, recently made an interesting report upon the progress made during the past year, from which we extract the following particulars as to the grounds, buildings, and transportation facilities:

The South Park system consists of two great parks connected by the Midway Plaisance, a strip of land a mile long and 600 feet wide, and united by boulevards with the heart of the city and with the West Side and North Side parks. Both Washington and Jackson Parks, and the Midway Plaisance, as well, have been placed at the disposal of the Columbian Exposition. The South Side system of cable cars connects with the two parks, and the Illinois Central Railroad passes near the western boundary of Jackson Park, and, with other roads, will be directly connected with the Fair during its continuance.

By reason of the greater picturesqueness of the lake shore site and the superior accessibility of Jackson Park, both by water and land, and for the additional reason that being now for the most part unimproved it is more readily adaptable to the purpose, Jackson Park has been chosen as the principal site of the Fair. The eighty acres at the north, which are now laid out and under cultivation, form but a small fraction of the entire area of this park, which extends a mile further south, broadening constantly along the curving shore of the lake. In this unimproved portion, much of which is thickly wooded with native trees, the ground is being prepared for a system of lagoons and canals from 100 to 300 feet wide, which with the broad, grassy terraces leading down to them will pass the principal buildings, inclose a wooded island 1,800 feet long, and form a circuit of three miles navigable by pleasure boats.

These canals, which will be crossed by many bridges, will connect with the lake at two points—one at the southern limit of the present improved portion, and the other more than half a mile further south, at the great main court of the exposition. At this point, extending eastward into the lake 1,200 feet, will be piers which will afford a landing place for the lake steamers and inclose a harbor for the picturesque little pleasure boats of all epochs and nations which will carry passengers along the canal, stopping at numerous landing places.

This harbor will be bounded on the east, far out in the lake, by the long-columned facade of the Casino, in whose free spaces crowds of men and women, protected by its ceiling of gay awnings, can look east to the lake and west to the long vista between the main edifices as far as the gilded dome of the Administration Building. The first notable object in this vista will be the colossal statue of Liberty, rising out of the lagoon at the point where it enters the land, protected by moles which will carry sculptured columns emblematical of the thirteen original States of our Union. Beyond this, beyond the first of many bridges, will lie a broad basin from which grassy terraces and broad walks will lead on the north to the south elevation of the enormous Main Building, and on the south to the structure dedicated to agriculture.

The main building, extending northwestward a third of a mile, will be devoted to manufactures and liberal arts, and will receive from all nations the rich products of modern workmanship. Recalling, architecturally, the period of the classic revival, it has the vivacity, the emphatic joyousness of that awakening epoch. The long, low lines of its sloping roof, supported by rows of arches, will be relieved by a central dome over the great main entrance, and emblematic statuary and floating banners will add to the festive character. The north elevation of the classic edifice devoted to agriculture will show a long arcade behind Corinthian columns supporting a series of triple arches and three low, graceful domes. Liberally adorned with sculpture and enriched with color, this building, by its simplicity, refinement, and grace, will be idyllically expressive of pastoral serenity and peace. At its noble entrance a statue of Ceres will offer hospitality to the fruits of the earth. Beyond it, at the south, sixty-three acres of land will be reserved for the live stock exhibit.

The lofty octagonal dome of the Administration Building forms the central point of the architectural scheme. Rising from the columned stories of its square base 250 feet in the air, it will stand in the center of a spacious, open plaza, adorned with statuary and fountains, with flower beds and terraces, sloping at the east down to the main lagoon. North of the plaza will be two buildings devoted to mining and electricity, the latter bristling with points and pinnacles, as if to entrap from the air the intangible element whose achievements it will display. South of the plaza will be Machinery Hall, with its power house at the southeast corner. A subway at the west wall will pass under the terminal railway loop of the Illinois Central road to the circular Machinery Annex within. North of this railway loop and along the western limit of the park will be the Transportation Building. Still further north, lying west of the north branch of the lagoon at the point where it incloses the wooded island, will extend the long shining surfaces and the gracefully curving roof of the crystal palace of Horticulture. Following the lagoon northward one will pass the Women's Building, and, eastward, will reach the island devoted to the novel and interesting fisheries exhibit, shown in an effective low-roofed Romanesque structure flanked by two vast circular aquaria in which the spectator can look upward through clear waters and study the creatures of the ocean and river. This building will be directly west of the northern opening of the system of lagoons into Lake Michigan, and in a straight line with the Government Building and the Main Building, which extend along the lake shore to the southeast.

North of the lagoon which bounds this fisheries island lies the present improved portion of Jackson Park, which will be reserved for the buildings of the States and of foreign governments. The Illinois building will occupy a commanding position here, its classic dome being visible over the long lagoon from the central plaza. Along the Midway Plaisance will be placed a number of special exhibits, like the historical series of human dwellings, reproductions of famous streets, etc., and it is probable that some of these may overflow into Washington Park. At the junction of the Midway Plaisance with Jackson Park is the site chosen for the Proctor tower, which, rising 1,100 feet into the air, will command a majestic view of the beautiful grounds and buildings, brilliant with light and color, and the great city lying between boundless levels of land and sea.

Thus the various portions of the exhibition will be equally accessible by water and by land. The traveler may come by carriage, by cable, or by rail, and be carried from one section to another on the elevated roads which will connect and perhaps penetrate the buildings, or follow the broad footways which will surround them. Or he may arrive by steamer from the lake and board one of the gay boats which will glide from building to building along the lagoons. But by whatever path he comes he will behold a scene of commanding beauty—noble edifices grouped with consummate art in grounds admirably disposed. The genius of the late consulting architect and his eminent coadjutors will here proclaim to the world the supremacy of American architecture and the artistic resources of the new world Columbus discovered four centuries ago.

New Signaling Inventions Called for.

On February 20 last a collision took place in the underground railway tunnel of the Harlem Railway Company at 85th Street, New York City, by which six persons were killed and several injured. The casualty was due to a rearward collision; an express passenger train going thirty miles an hour ran into the rear cars of another train moving in the same direction at six miles per hour. The cars of the slower moving train were telescoped and wedged together into a shapeless mass, a stove was upset and fire instantly added to the horror of the scene. The slow train was nearly empty, as it was on its way to the cleaning yard. Nearly all those who were upon it were hurt or burned to death. The tragedy was due to lack of audible signals. The railway is admirably equipped with the electrical block system of signals, with brilliant signal lights, but these, owing to the steam and smoke which fill the tunnel, could not be seen. Hence the sad result. It seems this most dangerous condition of things has been allowed to exist for years, with liability to accident at any moment. The fire was due to the car stove. Great public indignation was occasioned when this fact was made known. The officers and directors of the New York, New Haven and Hartford Railway Company were arrested, have been indicted, and will be tried. The New York State law forbids the use of stoves in cars on any railway of more than fifty miles length. As the cars of both the trains that collided are owned by the New York & New Haven Railway Company, which does not run for fifty miles within the State, it is thought the directors cannot be legally punished. But an attempt to do so will be made. The New Haven Company has not yet fully adopted steam heating.

The Grand Jury of New York state that some new system of audible signals is absolutely required. Here is a chance for inventive genius. It is hoped practical inventions in this line will soon be forthcoming. This is the way the jury presents the matter:

"The Grand Jury has been made satisfied that the present system of signaling in the Grand Central tunnel of the Harlem Railroad is inadequate. A part of this inadequacy is due to conditions of fog and smoke, which serve to obscure the signal lights. Some efficient system of audible signaling ought therefore to be added—some connection with the danger signal, which, in contact with the locomotive, should sound an alarm within the locomotive cab, as an unmistakable notification to the engineer that the danger signal is set against him. We further recommend that the State Railroad Commissioners be immediately empowered and directed by the Legislature to recommend and require such further improvements and means to public safety throughout this entire tunnel system as can be skillfully devised."

Judge Fitzgerald told the Grand Jury in discharging them that their action in the tunnel collision case had met with public approval, and is recognized on all sides to have been dictated by a high sense of the duties and responsibilities attached to their body. "Copies of the presentment," he said, "will be forwarded to the railroad commissioners, to both branches of the legislature, and to the Governor of the State, with a view of accomplishing any further legislation that may be necessary in order to compel those who are intrusted with large public franchises to adopt the best and most improved methods to secure public safety."

Artificial Rubies.

The experiments of MM. Fremy and Verneuil on the artificial production of rubies have been in progress for some years, but it appears from their recent communication to the *Comptes Rendus* that they have now successfully overcome the difficulties which attend their manufacture, and are obtaining much larger crystals. The artificial rubies have already been employed as pivots in watches, and are said not to be inferior to the natural stones in hardness. The process consists in heating alumina and a trace of potassium bichromate with barium fluoride or a mixture of fluorides of the alkaline earths to a high temperature for several days. Recent progress has been due to the discovery that the addition of a small quantity of potassium carbonate to the mixture, so as to render the fused mass alkaline, facilitates the formation of the crystals. It is believed that the crystals are produced directly from the interaction of the volatile compounds produced, and by employing crucibles of several liters capacity in gas furnaces as much as 3 kilos., or 6½ pounds, of rubies are obtained in a single operation.

THE Lick telescope is the most powerful glass in the world. It is reported the observers at Mount Hamilton have lately kept a sharp eye turned upon the shadow of one of the moons of the planet Jupiter. This shadow seemed double, indicating that the tiny moon which cast it is also double. Since the first hint of the discovery many observations have been made through the Lick glass, all tending to confirm the original impression, to wit: That this particular satellite of the greatest of the planets is double—a dot of a moon revolving around the main moon.

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A TOOL FOR DEHORNING CALVES.

The illustration shows a tool specially designed for conveniently and rapidly cutting out the horns of calves in such a way as to destroy all future growth of the horns. It has been patented by Mr. Charles T.

INGRAHAM'S DEHORNING TOOL.

Ingraham, of Dwight, Ill. The tool has two knife arms connected with each other by a pivot pin, and bearing segmental knives with V-shaped edges, as shown in Fig. 1, the edge of one knife being adapted to fit over the edge of the other knife. On one arm is a handle, by means of which the operator holds the tool in the desired position when a horn is to be cut out, which is effected by striking on the outer side of the other arm with a mallet, as shown in Fig. 2, a stop on the inner side of each arm limiting the inward movement of the knives. The knife on the arm which is struck by the mallet is designed to enter the skin and cut out the horn beneath it, coming out on the opposite side, and leaving a concave opening, on account of the dished form of the knives.

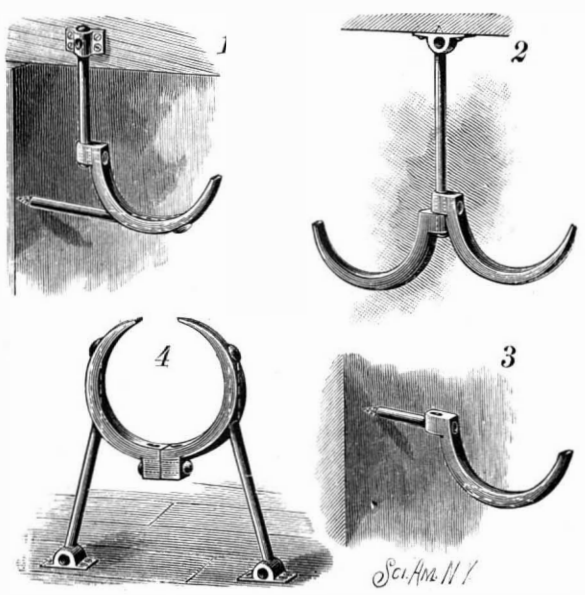
Fast Launches.

Included in the work turned out this winter by the Herreschoffs, Bristol, R. I., is the Mississqui, a steam launch 48 feet long and 7½ feet wide, built for W. Seward Webb for use on Lake Champlain. Her hull is mahogany. Her speed on trial was 19¼ miles an hour.

A steam yacht, 112 feet long, is now building for Wm. R. Hearst, a son of the late Senator Hearst, of California. She is to have a required speed of 25 miles per hour. A steam yacht, 98 feet long, is building for E. D. Morgan, of New York, the speed required being 23 miles an hour. A small steam launch, to be used as a yacht tender, is building for a New York gentleman. —*Boston Globe.*

AN IMPROVED PIPE HANGER.

The illustration represents a simple and inexpensive hanger whereby pipes of any size may be conveniently put up without the aid of a blacksmith, so as to be substantially supported and present a neatly finished appearance. It consists of a hook whose shank has holes at an angle with each other, the hook being supported by a rod adapted interchangeably to either of the holes, while the wall plate also has holes at angles with each other to receive and sustain the hanger rod. Figs. 1 and 2 show the hanger as used to support a pipe from the ceiling or from a side wall, and in the employment of extra hooks. The wall plate, also, has backwardly projecting spurs or teeth, to be driven into the wall to temporarily sustain the hanger prior to effecting a permanent fastening, and the central part of the hook



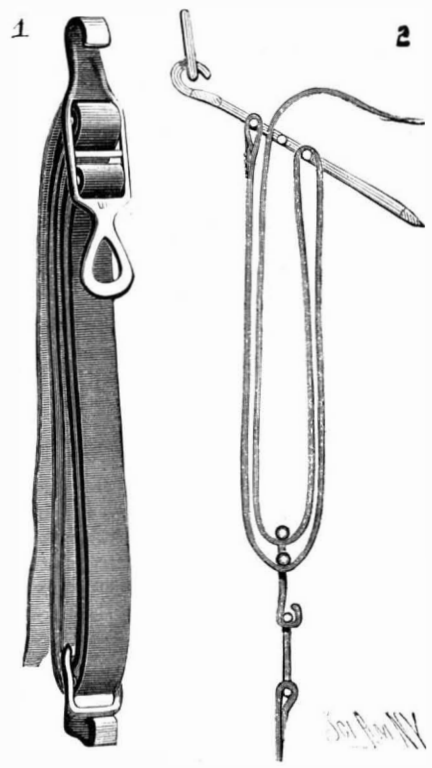
SCOTT'S PIPE HANGER.

body is perforated parallel with one of the shank holes to receive an additional sustaining spike, which may be used simultaneously with the hanger rods to support a heavy pipe, as shown in Fig. 1, the spike support alone being employed in Fig. 3. A heavy line of pipe may be supported from either the floor or the ceiling in the manner shown in Fig. 4, the hooks being bolted together to nearly encircle the pipe.

Further information relative to this improvement may be obtained of the patentees, Messrs. Frank G. and George L. Scott, No. 24 Spring St., Newport, R. I.

A SELF-ADJUSTING GIRTH FASTENER.

The illustration represents a simple and durable girth fastener adapted for general purposes, which is self-adjusting and self-locking, and readily tightened or loosened without the use of buckles. It has been patented by Mr. William T. McFarlane, of Stockton, Utah. Fig. 1 is a front view of the improvement, with a strap held thereby, in closed position, and Fig. 2 is an open side view. The fastener has an arm with one end formed into a hook adapted to be hooked on to a ring secured to the saddle tree, while the lower end of the arm has a handle, the arm being opened between the handle and hook and provided with three transverse bars. The end of a strap is secured on the uppermost bar, and the strap is passed downward under a cross-bar of an open frame connected by suitable links with one end of the belly-band. The strap is afterward passed upward over the lower cross-bar of the arm, thence downward under a second cross-bar of the frame, the free end of the strap being then extended upward loosely over the middle cross-bar of the arm. The strap is locked in place by the middle cross-bar, on account of the several layers of the strap lying close to each other, the pull being

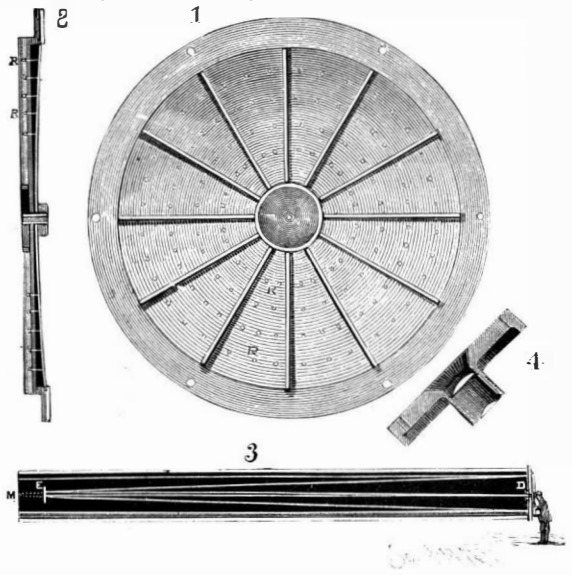


McFARLANE'S GIRTH FASTENER.

exerted in line with the strap, and, as no buckles are used, chafing or otherwise injuring the animal is entirely prevented. The two lower cross-bars, and the lower one of the upper bars, are preferably provided with friction rollers to ease the movement of the band.

AN IMPROVED ASTRONOMICAL MIRROR.

The accompanying illustration represents details of construction whereby concave mirrors of long focus may be readily produced from plane-faced mirrors, according to a patent issued to Mr. Dennis O'Brien, of Oswayo, Pa. Fig. 3 is a small view of a six foot telescope tube of seventy-two feet focus, of which M is the primary focus and also the inside focus of the convex hyperbolic mirror, E, whose outside focus, D, receives the enlarged and perfected image of the object, the image at D being as large as that formed by a single objective whose focal distance is 1,650 feet. To make such a reflecting mirror, a pan is employed for securing to the end of the tube and properly bending the plane mirrors, Fig. 1 being a rear view and Fig. 2 a sectional view of such a pan, which is three-eighths of an inch deep and half an inch thick, of a flanged construction, to give rigidity and lightness, and with marginal holes for bolting it to the tube and to facilitate handling it with tackle. The pan and mirror are designed to weigh only about 1,000 pounds. Fig. 4 shows the central disk, with a threaded tube to engage the threaded central aperture in the pan, against whose plane bottom it jams the mirror, unequal curvature being corrected by interchangeable set screws, R R, of which there are a number all over the rear of the pan, as indicated in the sectional view, Fig. 2. Convection is designed to be aided by means of curtains over the primary, and man holes are formed in the lower end of the tube for dusting, etc. The convex mirror, E, is designed to be adjustably arranged in such way that its focal distance may be changed either way as desired by the observer without leaving

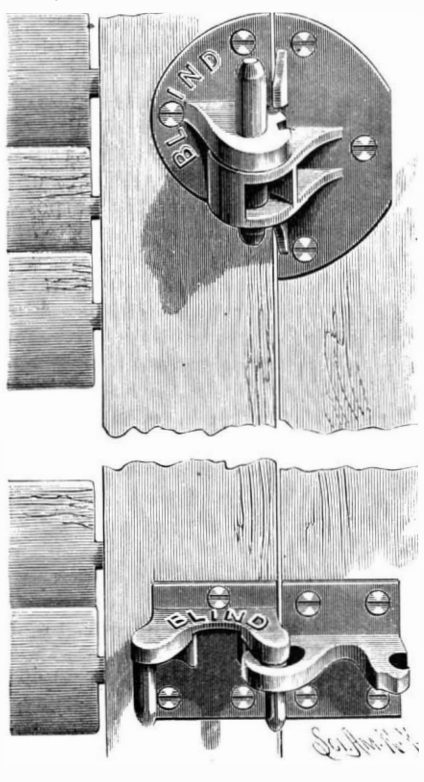


O'BRIEN'S ASTRONOMICAL MIRROR.

his position. Those desiring further information in regard to this invention are referred to the Business and Personal column of this issue.

REVERSIBLE BLIND HINGES.

The illustration represents some blind hinges patented by Rev. Lansing Porter, of Auburn, N. Y. The blind is suspended on the upper hinge, which leaves the lower hinge free from horizontal bearings, and, consequently, free from friction. On account of this structure and combination, the lateral movements of the lower end of the blind, in locking and unlocking, are made with great ease. This combination likewise results in strictly horizontal movements, thereby doing away with the necessity of lifting the blind. The act of locking the blind in open position is also free from friction, and is effected by the gravity of the revolving blind causing the shoulder in the rear of its pintle to travel the eccentric edge of the ear-shaped knuckle, thereby permitting the angle on the pintle to swing around the projection in the center of the slot, enabling that pintle to hold its twin pintle for the moment beyond the catch, thus avoiding contact and click and wear. Those hinges are also reversible, and can be used on one blind the same as on the other. The twin pintles in the lower hinge are invested with double functions, and are so constructed and located as to serve their different purposes interchangeably. While one of these serves as a pintle and the other as a lock on one blind, on the other blind they exchange functions. The same holds true in regard to the two shoulders in rear of the pintles, which also act interchangeably, either as a guide around the eccentric knuckle of the other leaf or as a bearing for the blind as a lever against the head of the stationary latch as a fulcrum, for the purpose of disengaging the pintle in the slot and of throwing the two leaves into parallel lines, allowing gravitation to lock the blind in open position. The reversible structure of these hinges is designed to diminish the first cost of manufacture and the subsequent assorting and handling of them. They are simple, cheap, strong, and durable, and work easily and efficiently.



PORTER'S HINGE FOR BLINDS.

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ELECTROPLATING THE DEAD.

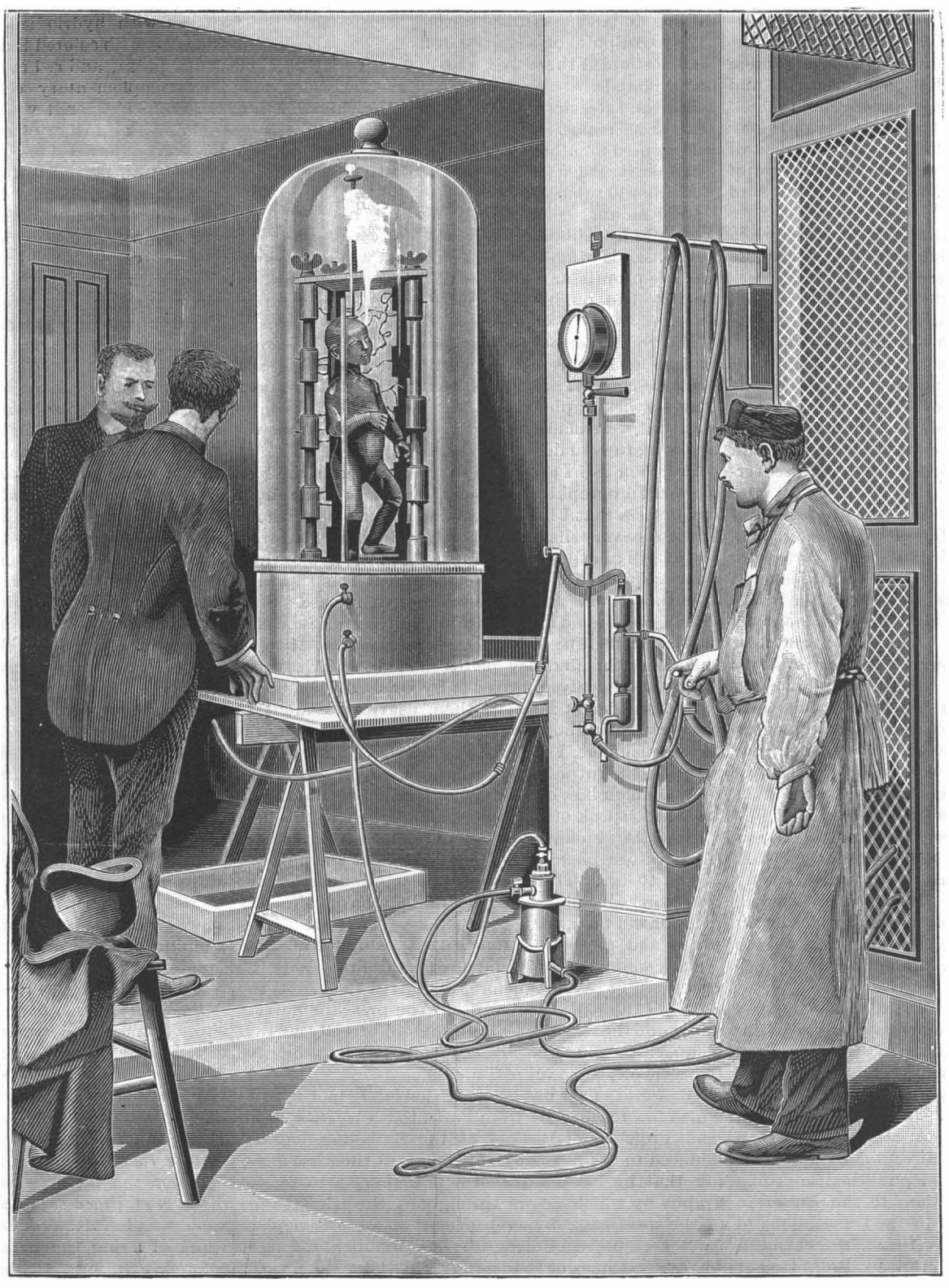
Man has always shown himself jealous of paying a peculiar adoration to the dead, and yet he has never taken more than an ordinary interest in the preservation of cadavers. The Egyptians, it is true, secured the preservation of the dead by very nice methods. Daubenton and, more recently, Czermak give us some information in regard to this. In ancient Egypt there existed special laboratories in which the bodies of the dead were submitted to more or less complicated manipulations. The cadavers were immersed in antiputrescible baths and then swathed by the relatives with thousands of bandages. But it may be asserted that the Egyptian embalming was, so to speak, an exception, for the rich alone were capable of having it done. In our time the art of embalming has not made much progress. Usually, the most that is done is to inject into the arteries of the cadaver a sterilizing liquid whose composition varies, and little attention is paid as to what will supervene. Besides, as in Egypt in the time of Ptolemy, this mode of preservation is applied only exceptionally.

Must we look to the imperfections of the processes for the little inclination that we seem to have for mummification or embalmment? Are we fatally obeying a law of nature—that law formulated in these words of the Scriptures: "Dust thou art and unto dust shalt thou return"? Dr. Variot, one of the most distinguished physicians of the Paris hospitals, answers these two questions by proposing to his contemporaries the use of electro-metallurgic processes for obtaining indestructible mummies. The doctor metallizes our entire cadaver. He surrounds it with an envelope of bronze, copper, nickel, gold or silver, according to the caprices or wealth of those who survive us. Does this awaken the reader's curiosity? Does he wish to know how Dr. Variot proceeds?

Glance at the reproduction of the drawing that we had made at the laboratory of the Faculty of Medicine, where the doctor is carrying on his researches. In a double frame with four uprights connected at the top and bottom by four square plates will be seen the body of a child, which has been perforated with a metallic rod. One of the extremities of this rod abuts against the arch of the cranium, while the other is inserted as a pivot in a metallic bearing situated in the center of the bottom plate of the frame. The frame support is a conductor of electricity. The uprights and conducting wires are carefully insulated with rubber, gutta percha, or paraffine. The electric current is furnished by three small Chaudron thermo-electric batteries. A circular, toothed metallic contact descends from the top plate and rests lightly upon the vertex of the cadaver. The lower surface of the feet and the palms of the hands rest upon two contacts. In addition to this, contacts are distributed along the uprights of the frame, in order to be applied at the desired points, with the possibility of shifting them at will.

Before immersing this apparatus in the electro-metallurgic bath, it is necessary to render the body a good conductor of electricity. To this effect, the operator paints the skin of the cadaver with a solution of nitrate of silver, or else sprays the cutaneous surface with this solution by means of a well known apparatus—the atomizer used by ladies for perfuming themselves. This operation having been performed, the skin becomes of an opaque black, and the silver salt has penetrated as far as to the derma. But it is necessary to reduce this silver salt, that is to say, to separate it from its oxide. To do this is very difficult. The double frame is placed under a bell glass, in which a vacuum has been formed by means of a tromp, and into which vapors of white phosphorus dissolved in sulphide of carbon are afterward allowed to enter. This is a dangerous operation, like all operations in which phosphorus in solution plays any part whatever.

After the phosphorus vapor has reduced the stratum of nitrate of silver, the skin of the cadaver is of a grayish white, and is comparable to the surface of a plaster cast that has been rendered conductive. There is nothing left to do now but to proceed as rapidly as possible to the metallization. To this effect, the double frame is immersed in the bath of sulphate of copper. We need not describe this operation, which is known to all. Under the influence of the electric current, the deposition of the metal goes on uninterruptedly. The molecules of metal deposit upon the skin of the cadaver, and soon form thereon a continuous layer. The operator must regulate the passage of the electricity with great care, in order to prevent a granular deposit, having but little adhesion. By shifting the contacts properly, he will substitute for the skin a coating of copper that will take on the pattern of all the subjacent parts. By attentively watching the thickness of the deposit upon the face, hands, and all the delicate parts of the body, he will obtain a faithful mould that will exactly recall the details of conformation and the tints of the physiognomy. A deposit of from ½ to ¾ of a millimeter in thickness offers sufficient strength to resist external bendings and blows. A thickness of from ½ to ¾ of a millimeter ought not to be exceeded for the metallic covering of the face and hands, which will thus be perfectly moulded. Upon the trunk, the abdomen, the first segments of the limbs, and the neck, the integral preservation of the plastic forms is much less important. So if it is judged proper to consolidate the metallic mummy, a deposit of from 1 to 1½ millimeters will be given.



ELECTROPLATING THE DEAD.

What is the future in store for this process of mummification, which Dr. Variot calls "galvanic anthroplastic"? It would be impossible to say. It is infinitely probable that metallized cadavers will never figure, except in small number, in our cemeteries, and that for a long, long time to come we shall undergo that law we recalled at the beginning: "Dust thou art and unto dust shalt thou return." The inventor of the process just described, however, accords to the total metallization of the body but slight importance. The object of his researches has been more especially to give the museums and laboratories of our faculties of medicine very faithful, very exact specimens, rather than to rescue our cadavers from the worms of the grave.—*M. Edant.*

Combustion.

A coal having the following composition, viz., 6 cwt. of volatile constituents, 12 cwt. of fixed carbon, and 2 cwt. of ash and moisture per ton, may be taken as about the average quality used in gas producers for furnace work. Leaving out carbonic acid, this coal would produce a gas of the following composition per volume: Hydrogen and hydrocarbon, 11·07 per cent; carbonic oxide, 29·7 per cent; and nitrogen, 59·23 per cent. Taking the hydrogen and hydrocarbons as approximately equivalent to CH_4, it will be found that they would require thirteen times that weight of air for perfect combustion, while the carbonic oxide made from the fresh carbon would only require about 2½ times its weight of air for perfect combustion. The heat developed by the combustion of the 6 cwt. of marsh gas would be equal to 78,000 C. units, whereas the heat developed by the 12 cwt. of fixed carbon, reaching the furnace in the form of carbonic oxide, would only amount to 67,200 units. From these figures it is seen that the hydrocarbons give in combustion considerably more than half the heat of the fuel, and how important it is to insure by free development of flame in furnace work that their heating effects should be entirely utilized.—*F. Siemens.*

Traffic of the Great Lakes.

A recent census bulletin relates to traffic on the great lakes, and shows that for the year ending June 30, 1889, freights were carried as follows: Wheat, 2,000,000 tons; corn, 3,500,000 tons; other grains, 1,000,000 tons; mill products, 2,000,000 tons; all other farm products, 200,000 tons; coal, 11,500,000 tons; iron ore, 15,500,000 tons; stone, 500,000 tons; salt, 500,000 tons; other products of mines and quarries, 100,000 tons; animal products, 100,000 tons; lumber, 12,250,000 tons; manufactures, miscellaneous merchandise, and other commodities, 2,500,000 tons; making a total of 52,000,000 tons, or more than 1,000,000 tons for each week in the year.

Spots on Venus.

A bulletin of the Belgium Royal Academy of Sciences states that the dark spots that have been noticed by observers on Venus are of a permanent character. Observations have been made of successive rotations of this planet, and the facts demonstrate that after an interval of three years the spots were fixed enough to be recognized, and that the markings are not accidental, but are probably due to some configuration of the land, like those of the planet Mars. The atmosphere is so dense on Venus that the success of the recent observations was much interfered with.

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Photography as it was and is.

The art of photography has been so largely developed in America as elsewhere of late years, that it has taken its place beside painting and sculpture, and the camera holds a high position as a valuable adjunct to the pencil and chisel. Like everything else which encourages a taste for the beautiful, it also contributes to elevate and refine the masses. It is a grand privilege to represent the sublime in natural scenery, to bring to the life before us the scenes of other lands to their minutest details, and to delineate the face and form of the great and good, and loved ones, full of expression, caught by the life-giving rays of the sun. From the highest and best developed photograph, perfect in pose, lights and shadows, to the commonest tintype, a new source of pleasure, amusement, and profit has been introduced into the world by photography.

Having been an ardent devotee of the art since its earliest introduction here, through the times when photography required severe study in its chemistry and manipulation (before Kodaks were thought of for lazy people), I think a few notes on its progress to its present perfection may not be uninteresting.

Photography may be said to date its origin from the time of Baptista Porta, who discovered the camera obscura in the 16th century. Between this period and the time of Wedgwood and Davy only a few isolated facts bearing on the case were brought to light at long intervals, and it would profit little to mention them all in their order. I shall only give a brief description of the most important discoveries up to the time of Daguerre and Niepce.

The property possessed by the salts of silver when decomposed by the action of light was well known to the earlier chemists. Mr. Wedgwood, however, was the first who recorded his attempts to use the sun beams for photographic printing. In the year 1802 he published a paper in the *Journal* of the Royal Institution, of London, an account of a method of copying painting upon glass, and of making profiles by the agency of light upon nitrate of silver, with observations by H. Davy, afterward Sir Humphry Davy. From this paper we get the earliest process of sun painting and the first indication of the great discoveries which have followed.

In the year 1812 M. Berard brought the result of some valuable experiments before a commission, composed of MM. Berthollet, Chaptal, and Birt, who stated in their report that M. Berard had discovered that the chemical intensity was greatest at the violet end of the spectrum. When he left substances exposed for a certain time to the action of each ray, he observed sensible effects, though with an intensity continually decreasing in the indigo and blue rays. Hence they considered it as extremely probable that, had he employed more sensitive agents, analogous effects would have been attained. From that time numerous experiments were conducted by several eminent researchers, including the discovery of the more celebrated MM. Niepce and Daguerre.

The experiments of M. Niepce date back to 1814, but it was not till 1828 that he was made aware that Daguerre was pursuing the same line of studies. After this their investigations were prosecuted in common, and later came the discovery of the branch of the art since known as the daguerreotype. In 1833 M. Niepce died, and in 1839 Daguerre communicated his discoveries to the world.

Prof. S. F. B. Morse was in Paris at that time and sent the formulas of the Daguerre process to his brother Sidney Morse, then editor of the New York *Observer*, and he published them. The professor returned to New York the same year and commenced experiments with Prof. John W. Draper, of New York University. The latter gentleman had for more than ten years worked in the same direction as Daguerre and Talbot, long before they had published anything on the subject. In communications to the American Institute and articles published in the transactions of the *Journal* of the Franklin Institute, the chemical effects of light had been treated of by Prof. Draper (or Dr. John W. Draper, as he was best known). He also habitually used sensitive paper, and so early as 1837 examined the impressions of the solar spectrum, proving the interference of chemical rays (*i. e.*, their destroying of each other's effect); investigated the action of moonlight and of flame, either common or colored, red or green; also the effect of yellow and blue solutions and other absorbing media, the decomposition of carbonic acid by lights, etc.

Dr. Draper solved the problem of photographic portraiture, having made the first portrait from life ever taken by any photographic process. In March, 1840, he sent an account, which was published in the "Edinburgh Philosophical Magazine," of his process in detail, and sent specimens of portraits he had taken under the brilliant summer sun of New York. Daguerre had not then ventured on portraits, as it was supposed to require 25 minutes' exposure for a landscape alone. Sir David Brewster confirmed this in an article to the Edinburgh *Review*, January, 1843.

The different processes that followed Daguerre's were very numerous, and some of the most prominent were those of Fox Talbot, Sir W. J. Newton, M. Le Gray, Dr. Diamond, and Messrs. Geoffroy and Lespiault. Nearly all of the above were excellent, and gave fair results and were extensively used by both professionals and amateurs. In 1851 Frederick Scott Archer made known his beautiful collodion process on glass, which was a most important addition to the art and superseded all others known. The value of his discovery can hardly be overestimated, when we take into consideration the great benefits which have accrued from it, as well as the application of the process to so many branches of art that give intelligent employment to thousands of people and bring into use millions of capital. Its employment, however, required serious brain work and the most delicate manipulation to secure success. To give an idea of the value of photography in an industrial point of view, I will give a few statistics very carefully taken twenty-five years ago:

Silver bullion manufactured into nitrate of silver, 50 tons per year.

Pure gold manufactured into chloride of gold, half a million dollars' worth.

Hypersulphite of soda, 550 tons.

Of acetic acid there was sold in New York City alone 50,000 pounds.

Saxe and Reeve's paper supplied the United States with 30,000 reams.

Eggs used for albumenizing paper over 37,000 pounds.

Sulphuric ether for New York alone, 40,000 pounds.

Alcohol 15 thousand gallons.

Card mounts could hardly be estimated, but they were sold by millions.

Thousands of dollars' worth of glass was sold yearly, and the proprietor of one establishment informed me that he had on his shelves $20,000 of photographic glass.

The iron for ferrotypes was imported from Wales, and at least 100 tons were used yearly. In future this will be made here. Thus it will be seen of what importance the art of photography is to us, and if reliable statistics were made to-day, I do not doubt that the above figures would be trebled.

In 1856 or 1857 I exhibited to the members of the New York Photographical Society negatives made by a dry process that I had formulated about a year before. They were very sharp and beautiful in detail, but from the length of exposure (6 minutes) and the two or three hours required for the development, it was supposed that they could never come into general use. Soon after I made some modifications of the process which shortened the time of exposure to one minute. I think these were the first dry plates made in America, and they were heartily approved of by Dr. J. Draper, under whose presidency I served then, as vice-president to the New York Photographical Society. In my remarks to the members, I stated that I believed dry plates would in the future be universally used.

My opinion has been fully verified. It is not my intention to speak of the numerous workers in this field in America who have more than realized the dreams of early heliographers. I will just glance at one phase of the art to-day. The actual work is all done for the operator. Dry plates for the million have taken the place of wet ones, with a vengeance. They are all prepared, and all the solutions mixed ready for use. In my day we had to mix our own, and first study the chemistry of the art before we mixed them. As the sellers of the Kodaks advertise, "You press the button, and we do the rest." They have found literally a "royal road" to photography and a convenient one for travelers or people pressed for time.

The world of art has been startled lately by the news which has reached us from Paris, that Professor Lippman, Professor of Physics at the Sorbonne, has announced to the Academy of Sciences at their last meeting that he has discovered a new process in photography by which colors throughout the whole range of the spectrum can be reproduced on a sensitive plate most accurately. Colors are but numbers of light waves as outlines or shadows are fixed by the present photographic negative and print. The professor's first attempts to take colored photographs have not gone beyond the experimental stages. A long time will, I fear, elapse before this branch of the art is brought to the perfection of the others. After a few weak attempts the professor has succeeded in photographing a stained window in colors as brilliant as the original.

According to the meager accounts given to the public, it seems that the plates are pressed against the opening of a trough of mercury which formed a mirror in contact with the plate. The rays of light pass through the sensitive film, as in the old process, but on reaching the other side of the plate, instead of being absorbed by a dark background, they are sent back by an even surface of the mercury. In this mirror the whole secret lies, for apart from it the process is the same as in ordinary photography.

Daguerre frequently said that when he had been copying any red brick or painted building the photograph assumed a tint of that character, and he labored considerably for the attainment of colors. So did his colleague Niepce work to the same end, with his bitumen-coated tablets, and the report spread all over Europe that he had actually made the great discovery.

Sir John Herschel, the eminent astronomer and philosopher, actually succeeded in procuring upon paper impregnated with the colored juice of flowers a faint colored image of the solar spectrum. He also stated that he had specimens of paper long kept which gave a much better representation of the spectrum in its natural colors than he had before obtained. There is no doubt that Herschel was the first to discover the method of producing natural colors, about 1839 or 1840. It must not be forgotten that to his experiments we owe the introduction of hypersulphite of soda as a fixing agent, and he also first suggested glass plates for heliographic use.

Sir Robert Hunt experimented very much and obtained in many instances colored pictures of the spectral rays, dark upon a bright ground. His paper in the "Philosophical Magazine," for April, 1840, was entitled "Experiments and Observations on Light which has Permeated Colored Media," and in it he described some curious results on some of his photographs prepared with hydriodic salts, exposed to luminous influence, with colored fluids superimposed. The violet, blue, green, and red rays produced not their natural but complementary colors. Some pieces of paper which he prepared with bichromate of potash and a very weak solution of nitrate of soda were under colored glass for ten days, in a window having a southern aspect, and gave a tinting of blue, green, and red.

M. Edmond Becquerel experimented in 1849–50, and succeeded in producing on metallic plates the colors of the spectrum, and copied some colored prints. His process was as follows: Into a jar of muriatic acid diluted with from one to two parts water, he placed a silver plate, having previously connected it with a positive pole of a galvanic battery, the negative of it terminated by a strip of platinum. The silver and platinum were kept about one inch apart until the former became coated with the nascent chlorine to a violet hue. It was then rinsed and dried, and exposed to the colored rays. After an exposure of from one to two days a colored image was formed. He rarely obtained more than one or two colors at once. They were not brilliant and always evanescent.

In 1851 a nephew of Daguerre's partner, M. Niepce de St. Victor, published to the world that he was the discoverer of heliochromy, and that he could, by his process, copy colors from nature on silver plates. I am not aware of his formula, but he exhibited some pictures at the Crystal Palace in 1852, and although they were in a dark place, they had nearly faded out when I saw them. In 1856 I paid a visit to Dr. Diamond, of Surrey, England. He was then experimenting perseveringly with various formulas tending to color photography. He showed me the only good picture I have ever seen made with a camera and lens in colors. It was a view of an old-fashioned, two-story frame clapboarded house, with moss and lichens in many places over the doors and windows. The picture was partly colored, the lichens showing their yellow and gray markings, and the house of a dark brown color. It was very pretty, but the doctor said it was taken while he was experimenting and he could not account for it. It was really a sun picture in colors, and the only genuine one I have ever seen, at least such is my opinion.

About the same time Mr. L. L. Hill, a traveling daguerreotypist, announced that he had at last discovered the grand secret of heliochromy, and could take landscapes and portraits in their natural colors. This news created great excitement all over the scientific world, especially among those who were professed daguerreotypists. In conversation with Professor S. B. Morse on the subject, he assured me that he had made a visit to West Kill, the residence of Mr. Hill, and had seen the pictures said to be taken by his newly discovered process. According to his account they were wonderful productions of colored daguerreotypes of living subjects, as well as exact copies of colored paintings. Although the professor did not see the pictures made, he believed them to be genuine. Many distinguished men visited Mr. Hill, who was always ready to show his pictures, but I do not know of one practical man who ever saw him make one.

In November the same year a committee of the New York State Daguerrian Society paid Mr. Hill a visit, but he refused even to show them his pictures or give them any satisfaction in regard to his secret which was demanded as a right. On the return of the committee to New York a report was published signed by the members, stating that Mr. Hill had "not only deluded himself, but the whole history of his discovery was an unmitigated delusion." The committee, however, rather contradictorily charged Mr. Hill with making profit of his alleged pretense—a charge which is plain would rather militate against the admission of his delusion. They averred, in fact, that from the sale of his books and tuition of pupils attracted by the fame of his discovery he realized a handsome income, and this was the real object of Mr. Hill's announcement.

Later, in company with two other gentlemen, I made a visit to West Kill to Mr. Hill. We saw and ad-

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mired his pictures, but he would give us no satisfaction as to how they were made, although we offered to pay him handsomely for his trouble. We were obliged to depart without information of any kind; in fact, he positively refused to do anything more than show his pictures. We departed much chagrined after traveling 160 miles for nothing. We had strong surmises that there was really nothing in the process, and time proved we were correct. In 1856 he published a book giving partly his life history and a few formulas and many long letters extolling him on his great discovery. His formulas are very curious and complicated, but those who have tried them never succeeded in taking a picture even with the greatest care and accuracy. Whenever a failure occurred he always made the excuse that "the chemicals were impure, or your manipulation was not careful enough." Several friends and myself tried his formulas, keeping to the very letter, but produced nothing.

Thus it will be seen that photographs in colors have been the great desiderata, and have occupied the mind of every sincere worker more or less. Yet it has ever escaped perfect realization, even by such men as Sir John Herschel, the first to photograph spectral colors, and his successor, Sir Robert Hunt. That it can be done is evident from Dr. Diamond's accidental color picture, but as yet the full secret has eluded the grasp of the most patient investigator. I do not doubt we are on the eve of some revelation respecting it, especially as much more study has been lately given to the properties of light, a subject so vast, yet still wherein there are startling discoveries every year. Professor Lippman has made a step in advance in the right direction, and as far as he has made known his formula it is more simple than any of those of his predecessors. It remains to be seen whether any progress can be made so as to apply it to the arts and sciences. Should he succeed in perfecting this branch, it would be one of the greatest discoveries of the age. There would be "millions in it," for it would revolutionize photography.

NICOLAS PIKE,
First President of the Brooklyn Photographic Society, 1864.

A NOTABLE NEW PULLMAN PASSENGER TRAIN.

The superiority of the accommodations generally provided by our railways for the American traveling public is frequently commented upon by European visitors. It is to be remembered, too, that the comparisons usually made on this score are with the first-class passenger service of foreign countries, neglecting entirely the third and fourth class passenger cars, which carry three-fourths of the passengers, as with us substantially all the travel is what is known as first class. In most foreign countries it is never possible to be oblivious of the numerous class distinctions among the people, and the corresponding variations in the service are very numerous.

Our front page illustration represents a notable new train of Pullman cars just put into service, and which has been styled by the railroad men the "ghost train," because it is composed throughout of cars which are exteriorly of a creamy white. The lettering and outside decoration is done in gold, and the cars present a striking contrast with the cars of all other trains on the road. This train leaves New York for Boston at 3 o'clock every afternoon, except Sunday, over the consolidated road of the New York and New Haven and New York and New England lines, arriving in Boston at 9 P. M. A similar train, made up exclusively of the same style of cars, leaves Boston at 3 o'clock every afternoon, arriving in New York at 9 P. M. As the distance between the two places, by the route traveled, is only 227 miles, it will be seen that no special effort is made to attain a high speed, the rate of travel being a little under thirty-eight miles an hour, including stoppages, but for its clock-like regularity and comfort the service leaves nothing to be desired.

These cars have paper wheels, which is said to contribute to their easy running, and are brilliantly lighted by gas at night, their platforms also having special burners. The gas supply is carried in cylinders nine feet long under each car. No bell cords are employed, but each car has a conductor's signal connecting with the engine, there being just over the door a short lever working in a pipe connecting with a rubber hose under the car supplied with compressed air, whereby a whistle may be blown in the engine cab. Near this lever is another lever by means of which the conductor or any passenger can open a valve to operate the air brakes for stopping the train. The cars are at present fitted with the Baker heaters.

Each train has a combination car, regular passenger coaches, and drawing room cars, there being thirteen in all of these specially built cars provided for the daily make-up of the two trains. The combination car has a small portion of its forward end adapted for a baggage room, the remainder being fitted up for a smoking room, with upholstered willow chairs, a rich carpet on the floor, and the windows fitted with white shades and draperies. The drawing room cars have each twenty revolving chairs and six reclining chairs, and all modern conveniences to promote comfort in traveling are provided. The cars cost about $8,500 each.

Electricity in Foreign Countries.

Experiments are now going on in Germany with electric currents of very high tension, which have a good deal of interest to architects, who are called upon, each day more and more, to plan and direct the introduction of electric appliances in their buildings. Every one will remember, says *The American Architect*, the somewhat acrimonious discussion of a year or two ago about the danger of alternating currents of electricity at one thousand volts pressure, and the proposition of a company in England to use a ten thousand volt current was looked upon as wildly reckless. Now, however, a line is in process of construction to carry a current of twenty-five thousand volts. The line is to be about a hundred miles long, and is to extend from the Falls of the Neckar, at Lauffen, to Frankfort-on-the Main, along the railway route, through Heilbronn, Jaxtfeld and Hanau. It is to be used to convey a force of about three hundred horse power, obtained from the cataract by a turbine wheel, to the building of the electrical exhibition in Frankfort, and the object of using a current of such high tension is to reduce the cost of the wire, under the rule that the smaller the wire, the greater the resistance, and the higher must be the electrical pressure of the current to force its way through it. The current is obtained from a dynamo which delivers it at a pressure of one hundred volts, and is passed through a transformer, which changes it into one of much higher tension. On arriving at its destination, a second transformer changes the current back again into one of one hundred volts, suitable for actuating motors and for feeding incandescent lamps. In the experiments which have already been made, the two transformers were connected to dynamos, a wire about three miles long being stretched between them, passing in various directions about the territory connected with the station. On setting the dynamos in motion, a current of thirty-three thousand volts, as measured by a Thomson voltmeter, was developed, which was reduced without difficulty to one hundred volts by the second transformer. A trial was then made to determine how great would be the tendency of such a current to leave the wire, it having been asserted that a far more feeble current would jump several feet from a wire, to strike a man standing below. With this object, the wire was cut, and the two ends cut brought slowly together. Under a difference of tension of twenty-two thousand volts between the two pieces of wire, no spark forced its way across the intervening space until the ends had been brought within twenty-two millimeters of each other—less than an inch. Another experiment was tried, to see whether the ordinary safety cut-off could be used with so strong a current. A ball of lead was interposed in the circuit, and the effect of the fall of a loose wire, or of a tree, was imitated by dropping a piece of wire across the circuit. The short-circuiting thus caused was instantly felt by the lead ball, which melted, with a flash and small explosion, cutting off the current.

The New Circuit Court of Appeals.

The act to establish a Circuit Court of Appeals, which was approved by the President on March 3, provides for a Court of Appeals of three judges, in each judicial circuit, of which two are to constitute a quorum. The Chief Justice of the Supreme Court, the associate justice assigned to each circuit, and the district judges, are competent to sit in the respective circuits. Any judge before whom a case has been originally heard in the district or circuit court is prohibited from sitting at the hearing of the case on appeal. The term of the court commences the second Monday in January in the cities of Boston, New York, Philadelphia, Richmond, New Orleans, Cincinnati, Chicago, St. Louis, and San Francisco. Appeals from existing district or circuit courts to the Supreme Court may be taken in cases involving the construction of the Constitution, but in admiralty and patent cases the decision of the circuit court of appeals is final. The circuit courts may, however, certify to the Supreme Court "any question or proposition of law concerning which it desires the instruction of that court for its proper decision." In any of the classes of cases made final, which includes patent cases, "it shall be competent for the Supreme Court to require, by *certiorari* or otherwise, any such case to be certified to the Supreme Court for its review or determination."

Patentees of inventions, owners of patents, and inventors have, says the *Electrical Engineer*, abundant cause to congratulate themselves upon the passage of this much needed act. Heretofore, more especially during the past ten years, many of the decisions of the Supreme Court in patent cases have been, to say the least, far from satisfactory. Not only have appealed cases been compelled to wait many years for hearing and final determination, but the crowded state of the calendars has rendered it wholly impossible for the justices to bestow upon intricate and complicated questions anything like the amount of consideration necessary to the proper disposition of them, and in fact many of the opinions themselves are quite sufficient to show that the technicalities of the case could have been but imperfectly understood. The assertion which has often been made, that in cases difficult of comprehension the decision of the Supreme Court has uniformly been adverse to the patent, does not appear to be altogether without reason. The establishment of the new court will not only insure a much more speedy determination of appealed cases, but a far more careful consideration of the points at issue than has heretofore been possible, and we feel well assured that interests of honest litigants, as well as of abstract justice, cannot but be greatly promoted. Such a result must necessarily have a most favorable effect upon the value of patent property, as well as upon the progress of invention and the development of the electrical arts.

Protection of Timber from the Teredo.

Naturally, where the damage possible to be inflicted by the teredo is so great, every art has from time to time been employed in attempts to counteract the effects. The old method of coppering the vessel's bottom has been long in vogue, and is, of course, successful. It was found impracticable, that is, too costly, to use this method of preserving piling and wharves. It was thought that the timber could be poisoned, and many rank poisons, such as arsenic, strychnine, corrosive sublimate, etc., were tried, but the teredo seemed to thrive as well upon timber so treated as in unprepared timber. Solutions of metals, such as zinc, copper, and iron, were also infused in the wood, but proved of no value for the purpose of defense against the mollusk. Some of the properties of coal tar have been found effective, but in the pure state are so soluble in water as to quickly wash out. It was found by experiment that, when combined with creosote oil—which is a colorless fluid of strong antiseptic qualities, distilled from wood—the properties of coal tar were practically insoluble in water, and that the oil remains in timber after years of submersion as strong as when first injected. This result seems to be the perfection of prevention, for creosoted piles and timber which have been exposed to the teredo for as many as forty years show no evidence of having at any time been attacked, and are as good as when first placed in the water.

It is impossible to say what there is in creosote oil which makes it destructive to animals of cold blood. It seems to those who have studied the matter that, aside from being obnoxious in itself, the creosote oil so changes the appearance and smell of the wood that the teredo fails to recognize it as such.—*N. W. Lumberman.*

The Tomb of St. Francis Xavier at Goa.

This tomb itself must be admired as a masterpiece of art. It surpasses all one's expectations, and it is doubtful whether another mausoleum in the whole of India, or even Asia, excepting the Taj Mahal, could be found to equal it. Its three stages are built of rich marble of variegated colors. The lowest is of red and purple jasper and Carrara alabaster, adorned with statuettes of cherubs. The middle stage is of green and yellow jasper, the principal decorations of which are four beautiful bronze plates representing incidents in the life of the saint. The highest stage is surrounded by a beautiful railing of red jasper marked with white spots. This railing is adorned with figures of angels, and its middle portion is graced with columns elegantly carved, and standing at equal intervals. The intervening spaces are surmounted with arches, and have several incidents in the life of the saint represented on them. The friezes of its four lateral columns are of black stone with white stripes, while the plinths are of yellow jasper. On the top of this stage lies the far-famed coffin, overlaid with silver, in which the remains of the saint are deposited. It is a gorgeous receptacle, divided on each side into seven panels containing some exquisite plates presenting in relief some of the more important incidents in the life of the saint.—*Indian Engineering.*

Building in America.

New York, Brooklyn, and Chicago put up a great many structures in 1890, and made alterations to many others. The three cities spent over $158,000,000 in new buildings, and in New York and Brooklyn the cost of alterations amounted to $9,000,000. Permits were given in New York for the erection of 3,537 buildings, at a total cost of $74,900,812, and plans were approved for alterations in 2,417 buildings at a cost of $7,188,250. In Brooklyn 2,577 permits were issued for the erection of 4,800 buildings to cost $24,334,290, and for alterations in 1,275 buildings at a cost of $1,633,290. In Chicago over 50½ miles of frontage of new buildings were erected and $59,000,000 expended. This is the largest amount ever spent on new buildings in one year in that city, and it is expected that preparations for the fair will keep up the boom. New York and Brooklyn together spent nearly twice as much on new buildings as Chicago, but while the western city spent more than in 1889, New York spent $5,000,000 less, and Brooklyn $2,100,000 less

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THE CHIGNECTO SHIP RAILWAY.

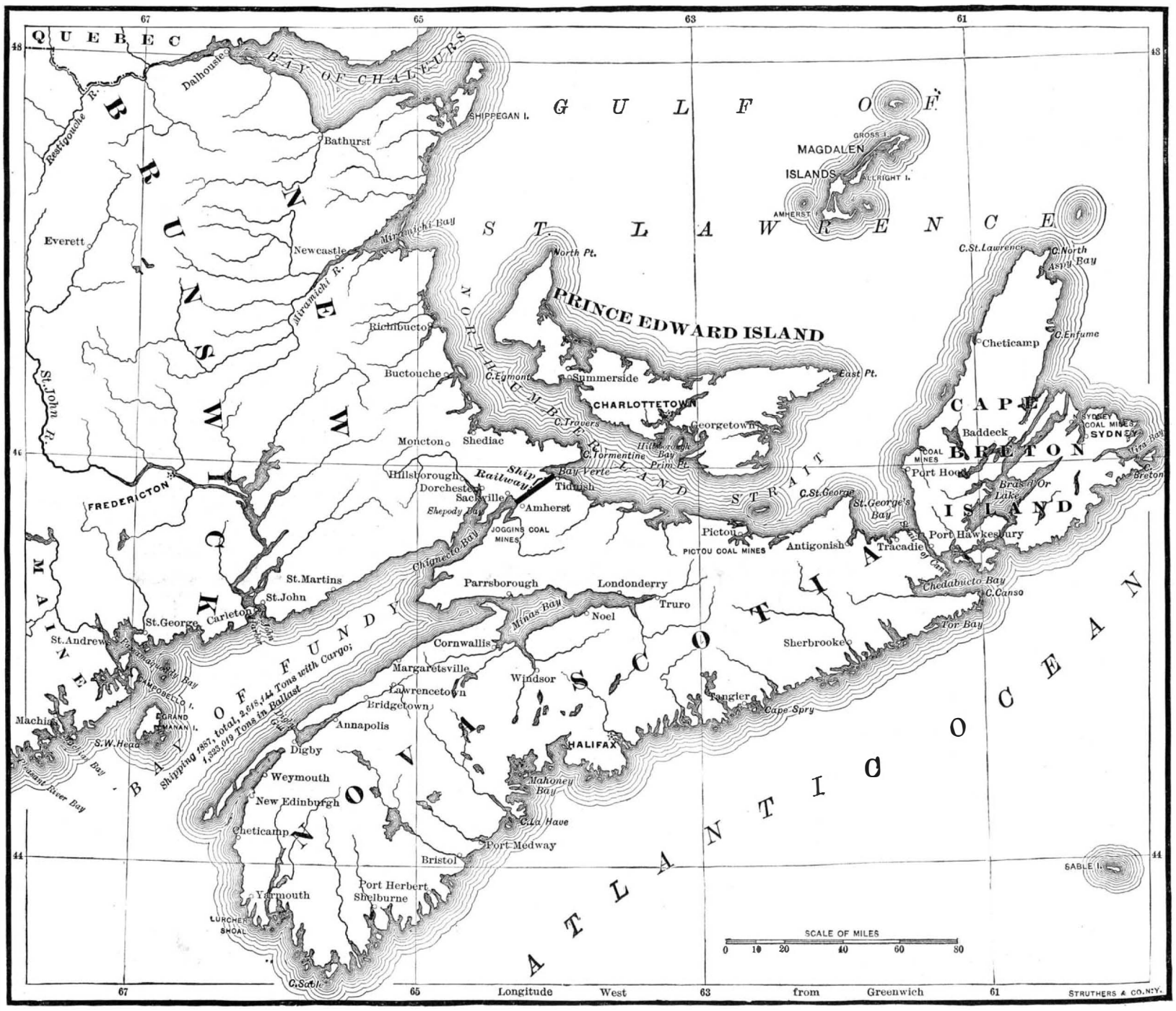
We give a map showing the location of an interesting and novel engineering enterprise which is now under construction in Canada. The proposal to carry ships by railway has been frequently discussed and elaborated before, notably in connection with the Isthmus of Panama and the adjacent Honduras and Nicaragua interoceanic routes, but the Chignecto ship railway is the first practical attempt to supersede canal communication by means of railway lines.

The narrow neck of land connecting the Province of Nova Scotia with the mainland of Canada has long been considered as a suitable site for a canal, to obviate the long and dangerous coasting voyage either by the Straits of Canso or that outside Cape Breton Island, a saving of some 300 or 700 miles respectively. The route has frequently been surveyed by engineers, but the heavy cost of cutting the canal and the practical difficulties connected with the extraordinary rise of the tides (some seventy feet at springs) in the Bay of Fundy have prevented the execution of the work. The scheme of Mr. Ketchum, C.E., for a ship railway, was finally adopted, and the Chignecto Marine Transport Railway was incorporated by special act of the Dominion Parliament, with a share capital of $2,000,000, and an authorized debenture capital of $3,500,000. The Canadian government, in consideration of the advantages to accrue to the maritime provinces and the intercolonial trade generally, granted to the company a subsidy of $175,000 a year for twenty years from the opening of the line. The capital was raised in London, and a contract made with Messrs. Jno. G. Meiggs & Son for the work. Construction was commenced in September, 1888. Sir John Fowler and Sir Benjamin Baker, the well-known engineers of the Forth bridge, are associated with Mr. Ketchum in the superintendence of the works, which it is expected will be completed in the autumn of the present year, 1891. The principal portions of the great work are now approaching completion.

The map which we give shows the position of the railway and the great saving of distance to be effected by the use of the new route, which will moreover permit the use of lake-going vessels in the coasting trade between New England and Canadian ports. A basin 500 feet long and 300 feet wide is constructed at the Bay of Fundy end of the line, with a gate to inclose the water when the tide is out. Leading from this basin is a lifting dock 230 feet by 60 feet, containing twenty hydraulic presses for lifting vessels with their cargoes a height of forty feet. The vessel is floated into position between the presses and immediately over a gridiron and cradle, the whole being then raised by the lift until the rails supporting them are brought up to the level of the rails on the railway. The vessel and the cradle (which rest on wheels) will then be hauled off, by hydraulic apparatus, to the railway track. The extreme weight proposed to be raised is 3,500 tons, including the gridiron cradle and a loaded vessel of 2,000 tons displacement, or 1,000 tons register.

The railway is a double track, seventeen miles long, perfectly straight and on almost a dead level, the steel rails weighing 110 lb. to the yard. The large number of wheels carrying the cradle will distribute the load, so that each wheel only carries a comparatively small burden. Two locomotives, one on each track, are calculated to move with ease the largest vessel proposed to be carried across, at the rate of ten miles an hour. On arriving at the terminus a reversal of the process will lower the vessel to the water level, the whole transit occupying a period of two hours.

It seems probable that, when the practicability of the system has been demonstrated on the Chignecto railway, the transport of ships by rail may be adopted on several routes where for various reasons waterways cannot be provided. Theoretical objections to the scheme meantime have little weight in face of the opinion of the eminent engineers who have planned and now superintend the work, and of the support of the Canadian government, evidenced by the guarantee given to the capital. In subsequent numbers we intend to illustrate the details of this remarkable work.



MAP SHOWING THE LOCATION OF THE CHIGNECTO SHIP RAILWAY.

The New York Pasteur Institute.

Dr. Paul Gibier, Director of the New York Pasteur Institute, in his first annual report gives as follows the results of the preventive inoculations against hydrophobia performed at the above institute during the first year of its existence (February 18, 1890, to February 18, 1891): 828 persons having been bitten by dogs or cats came to be treated. For 643 of these persons it was demonstrated that the animals which attacked them were not mad. Consequently the patients were sent back, after having had their wounds attended, during the proper length of time, when it was necessary.

In 185 cases the anti-hydrophobic treatment was applied, hydrophobia of the animals which inflicted bites having been evidenced clinically, or by the inoculation in the laboratory, and in many cases by the death of some other persons or animals bitten by the same dogs. No death caused by hydrophobia has been reported among the persons inoculated. Indigents were treated free of charge. The persons treated were from all parts of the country.

Shipping Subsidies in France.

The law on the merchant marine in France, whereby shipbuilders were paid a subsidy for vessels built, and owners a mileage allowance for French-owned ships, lapsed some time ago, but has been renewed, says *Engineering*, for another year. The act came into operation ten years ago and provided that shipbuilders should get for composite vessels, when built, 45 francs per ton gross register; for wooden ships of over 200 tons, 20 francs per ton; and for iron and steel vessels, 60 francs. French ship owners get for long distance voyages 1·50 francs per 1,000 miles, with a diminution every year of 7½ centimes for wooden and composite vessels and 5 centimes for iron vessels. This applies only to vessels built in France or to vessels built or purchased for French owners prior to the passing of the act ten years ago. French vessels built abroad subsequent to the passing of the act only get half these rates—75 centimes per 1,000 miles; but vessels built abroad and not put under the French flag prior to the lapsing of the act a week or two ago, secure no subsidy. Some new building firms have been created under the law, notably Chantiers de la Loire, Nantes, and St. Nazaire. The Compagnie Transatlantique do not receive a subsidy. They have, instead, a subvention from the government in connection with the New York and West Indian mails. The report of subsidies paid in 1889 has just been issued, and shows that 8,486,531 francs, equal to $1,675,000, were paid in shipping subsidies in that year, the number of vessels participating being 415, and the tonnage 348,857 tons. To earn the subsidy these vessels sailed an aggregate of 7,975,362 miles. In 1882 the subsidies were $400,000 less than in 1889.

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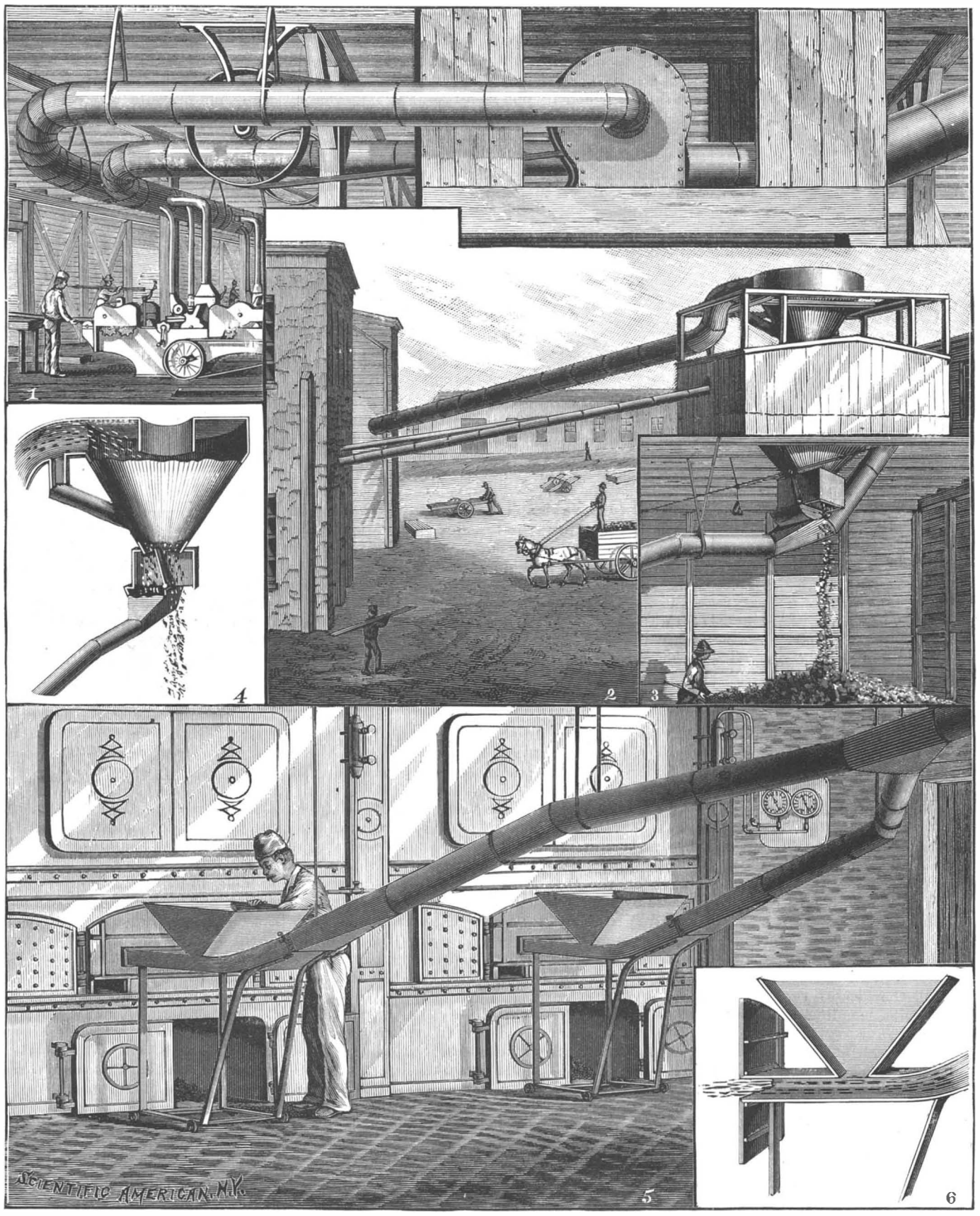
AUTOMATIC SAWDUST FEED FOR FURNACES.

The consumption of sawdust and shavings in sawmills effects a great economy in fuel. A large mill produces more such waste than is required to do the entire firing. In this vicinity sawdust is a marketable product, but the larger chips from planers are not readily disposed of. These are practically a waste product. They are so bulky that if handled in the ordinary way much labor is entailed.

Another trouble in connection with the dust and chips is their rapid accumulation around the planers and sawing machines. Incidentally more or less dust is always present under ordinary circumstances in the atmosphere of the room, and, of course, is an element of unhealthfulness.

The Dodge Lumber Company, of West End, Jersey City, N J., have recently introduced a system of ventilation and boiler firing in their extensive mills that automatically removes all the chips and dust from the machines, transports it to a special building, and thence carries a supply to the boilers. The whole system is entirely automatic, and is controlled in its operations by a few valves. Its leading features are shown in the illustration.



AUTOMATIC SAWDUST FEED FOR FURNACES.

Upon the second floor of the building a double exhaust and force blower, shown in Fig. 1, is established. This is a Sturtevant 60-inch centrifugal fan, with two 22-inch inlets, and the same outlets, which are brought together in a long Y-branch, the outlet pipe thence onward being single and of 30 inches diameter. The blower comprises practically two fans, mounted on one bed plate, with a single shaft and one driving pulley placed upon the shaft between them. This is driven at the highest speed, 1,300 revolutions per minute, and maintains a pressure of five ounces of water at the outlet.

The inlet pipes communicate with the machinery, as shown in Fig. 1 also. The main pipes are carried the length of the mill in lines corresponding generally with the long countershafts. These lines are gradually reduced in size as they extend further back from the fan. For each machine one to three drop pipes descend, according to requirements. Each drop pipe is provided with a hood or hopper to inclose a set of knives, or the saw teeth at the cutting point, as the case may require. A telescopic joint permits the hoods to be raised or lowered.

When the fan is in action a rarefaction is produced, causing a very strong in-draught of air at the mouths of these pipes. A handful of shavings raised to the mouth of one of them is drawn up instantly.

When a machine is in operation one or more of the pipes, with its hood or hopper attached, is adjusted so as to inclose the knives or cutting point of the saw. Every particle of sawdust and chips produced is drawn away and carried through the inlet pipes, fans, and outlet pipe to a separate dust bin. The latter is an isolated building, shown in section and elevation in Figs. 2 and 3. The large pipe carrying the shavings is seen leading to its roof from the left hand side of the picture. At the top of the building this pipe enters a dust separator, shown partly in section in Fig. 4.

The dust separator is simply a hollow cone. The blast enters its top tangentially, and the dust and shavings are caused to whirl around its inner surface with great velocity. The top of the cone is partly closed, a large central orifice being left open. Through this the air escapes, perfectly free from dust and chips. The latter, under the influence of centrifugal force, descend in a spiral down the sides of the cone. At the bottom of the cone a valve is placed, by which the material can be deflected into the dust bin or boiler supply pipes as desired. In Fig. 4 this arrangement is clearly shown.

As all the air escapes through the central opening, there is not sufficient pressure left to carry the fuel to the boilers. Accordingly a branch pipe connects with the main pipe, back of the separator, and is carried down so as to connect with the fuel pipe, as shown in Fig. 3. This insures a constant draught of air through the fuel pipes, carrying chips and sawdust to the boilers, when the valve at the foot of the separator is set to thus direct them.

In Fig. 5 the boiler fronts are shown. The fuel pipes connect with a perforated diaphragm fitted to the furnace doors. The end adapters of the fuel pipes are carried on a rolling frame, so that they can be rolled to one side at night or whenever desired. A hopper is arranged to permit of inspection of the operation. Looking into it, the stream of chips and dust is seen, and by inserting the hand it becomes filled in a second or two. The sectional drawing, Fig. 6, shows this feature. The hopper is also used for hand feeding. When the supply of fuel runs low, additional sawdust can be shoveled into the hoppers to be blown into the boiler.

A deflecting vane is provided just at the mouth of the fuel pipe, within the fire chamber, to prevent the fuel being blown too far back.

The grate bars are of about three-eighths inch opening. The engineer regulates the separator valve so as to get a supply of fuel in accordance with his needs. The auxiliary air supply he also regulates with a second valve. The object is to use as little air as possible with the fuel. The air for combustion comes as much as possible from below and through the grate bars.

The whole apparatus, which is very efficient and contributes greatly to the cleanliness of the mill, was put in by C. I. Roskoph & Co., of New York and Newark, N. J.

Mining in the Rocky Mountain States.

It is probable that the mining industry has never been prosecuted in the Rocky Mountain States at such profit as at the present time. The geology of the various mining districts is becoming better understood through the work of the geological surveys of the various States and the studies of local engineers carrying on the investigations begun by the United States Geological Survey. Mining investments are being more intelligently made, and mining enterprises everywhere are being more systematically and more economically managed.

Mining operations which, from the days of the Comstock bonanzas until after the time of the discovery of the rich lead carbonate ore bodies of Leadville, had been regarded in the light of purely speculative enterprises, are now becoming looked upon as legitimate business undertakings, and are being conducted as such. The fact, also, is becoming well understood and appreciated that with honest and intelligent management a good mining investment is safer and pays a larger interest on its capital than any other. The largely increased output of the gold, silver, lead, and copper mines of the Western States, the increased dividends that are being paid, and the number of new companies that are now being incorporated are evidences of this opinion.—*Engineering and Mining Journal.*

AT the sluices near Maigrange, according to M. Cuony, ground ice forms about the iron work largely used in the sluices, and is got rid of by heating the upper part of the structure with wood fires. M. Cuony produced ground ice experimentally, by cooling an iron bar 10° to 15° below zero C., and plunging it in cold water; thus illustrating the part played by the piles of bridges.

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Correspondence.

Large Quarried Stones.

To the Editor of the Scientific American:

You speak of the granite mass quarried by the Bodwell Granite Company, at Vinal Haven, as the largest ever quarried. It may be the largest *granite* mass ever quarried, but at Baalbec, in Syria, the traveler sees a stone at the quarry nearly ready to be moved from the pillars that support it, a stone 71 by 14 by 13 feet, containing 12,922 cubic feet, whereas the Vinal Haven stone, if the size at the base continued to the top, would contain but 11,500 cubic feet. And this stone has waited for more than a thousand years. There are four stones nearly as large, which have been transported a mile or more and put into the foundations of the Temple of the Sun. The ancients did know how to handle big stones, and we have not yet quite reached their standard of size. JOHN R. THURSTON.

Whitinsville, Mass., March 27, 1891.

A Winter Fishing Ground.

To the Editor of the Scientific American:

I was very much interested in an article on "Fish Manure," in your paper. I wish to suggest something perhaps of value to your manhaden steam fleet Down East. Their season is from May till November. When a big boy, I spent one winter at Charlotte Harbor, west coast of Florida, with mullet fishermen from Mystic, Conn. I believe mullet are as plentiful on the Florida coast as are the menhaden on the New England coast. And perhaps your steam fishing fleet, instead of lying on their oars all winter, would do well to turn their attention to the shores of the Gulf of Mexico. I believe there are fish enough in the Gulf of Mexico, if they were utilized, to feed the whole world. Those fishermen that I was with seined the mullet and dry-salted them for the Havana market. The mullet is a very oily fish, there being a layer of blubber next their ribs of varying thickness.

If these fish may be utilized, what an outlet for your fishing industries during the pleasant winter months in the Gulf of Mexico! The time I speak of was 'way back in 1855. And I don't know but they are steam-fishing there now. EX-BEACH COMBER.

Nashville, Tenn.

Utilization of Sawdust.

To the Editor of the Scientific American:

W. D. says: Your journal is one of our "household words." You have for years at different times given us receipts for sawdust casts and other materials. I have tried all of them, some are too heavy, some shrink too much, and some through too little shrinkage are liable to either break themselves, or break the mould if of wax or plaster and cement, which latter make a good mould for small articles.

I wish your readers to try the following and they will be perfectly satisfied with the result. Make a jelly paste equal parts rye flour and glue; take equal parts of sawdust and common wheat flour; to every half gallon measure of this latter mixture add half cup of molasses. Now knead into a very stiff dough, using as much of the jelly paste as you require, but it must be very stiff. Oil moulds with neat's foot oil and press your dough into all parts, tamping it down smooth with a roller or flat piece of wood. Let stand 24 hours in a dry place. It will then shake out easily on to a papered tin or common oven pan.

Take a soft brush and oil the face of the pattern you have got out of your mould, mending any small imperfections that may exist in your casting, and with a sharp knife or chisel remove all outside edge, or rather I would say, "Trim your cast neatly now." Bake in a moderate bread heat oven, and remember one thing—directly all the moisture is out of your piece of work, it will begin to burn very quickly. So you must watch your oven very carefully.

By following these directions carefully, you will have a casting equal to any piece of carved wood. Shellac or paint when cold.

Anti-Fouling Compositions for Ships' Bottoms.

To the Editor of the Scientific American:

We note Mr. Ganse's remark that "the party who would invent a reliable anti-corrosive and anti-fouling composition would make a fortune."

Allow us to state that such a composition has already been in use for the last twenty-seven years in England and Germany, the so-called Hartmann's "Rahtjen's composition."

This paint has been used by the North German Lloyd steamers since 1864, and they are continuing its use up to the present date. Furthermore, it is almost exclusively used by the English navy, upward of sixty of their ships being coated with this composition, and only recently the largest man-of-war in the world, the Royal Sovereign, has been painted with the same.

We have had considerable experience with this composition, and must admit that it is the best anti-corrosive and anti-fouling composition manufactured at this date.

It thoroughly protects the iron and steel against rust, grass, and barnacles. It reduces the skin friction, thereby increasing the speed, with the use of less coal, as against a dirty bottom.

We have frequently known steamers to run with this composition one whole year without docking, and as for the price, it only costs about $250 to coat a vessel of about 1,800 tons gross register, with two coats.

We do not think that any ship-owning firm, be it government or private, would want a vessel to run three years without docking, as is claimed for the Japanese lacquer. We think it is to the ship-owner's interest to see his vessel's bottom at least once a year, for various other reasons besides painting, and even though the vessel be coated with Japanese lacquer, she would incur, we think, the expense of docking once a year, the same as if she were painted with any other composition.

The lacquer is said to dry in one day, so that it will take two days for two coats, whereas the Hartmann's Rahtjen's composition dries as quick as applied, thus enabling two or three coats to be given in one day, and the vessel can be put into the water immediately after being painted.

A peculiarity of the lacquer is that it cannot bear the sun well, and consequently the ship must be covered with mats in order to keep the sun off as much as possible. The cost of the lacquer being so enormous, it will hardly be extensively adopted by the merchant marine. GUSTAVUS & CO.

Baltimore, March 21, 1891.

The Duties of the Steam Engineer.

In taking charge of a plant and of steam boilers or generators of steam under pressure, and engines, the engineer must make himself acquainted with the nature and condition of his machinery and all its details, and first of all, of his boilers and steam generators, as to their safety and security against explosion from weakness. When time is permitted, the condition of the interior of the boiler, regarding its cleanliness, the safety valve, water gauges, and steam pressure gauge, should be known, and if the pressure gauge is not known to be correct, and no means at hand to test it, the safety valve should be carefully examined and computed and adjusted to resist or hold down only a safe boiler pressure. The check valve, blow-off, and in fact all parts of the feed apparatus must be known to be in working order, that is the pump, injector, or inspirator. The suction, supply pipe, and the source of feed water should be made sure of performing their functions. The furnace, flues, and chimney should be examined and put in order if so required. Last, but not least, the engineer should see that the steam pipe, cocks, and valves are in order and properly secured; the engine in line, shafts, rods, pins, and journal boxes in good and smooth condition, keys and bolts secure and properly adjusted, piston packing and stuffing boxes, eccentrics, and straps put in proper condition and all lost motion taken up. The steam slide valve, or any other kind of valve regulating the admission of steam, and its seat, should receive proper attention, and the valve motion, if necessary, be adjusted. For a close and accurate adjustment the valve rod should be marked on the outside of the steam chest to show or indicate by the use of a gauge the relative position of the valve; then the proper adjustment can be made when the engine is at a working temperature. The adjustments may also be made on large and automatic cut-off engines from the reading of indicator diagrams.

The condition of flywheel, pulley, and belt with the line shaft, their bearings and lubricating devices, should be ascertained before any attempt is made to fire up the furnace. During the process of raising steam, observations should be made to note the actions of furnace and boiler and its appendages. Before starting the engine by steam, turn over the engine shaft once or twice to see that no obstructions are in the way of rotation. An engine should not be started to running until a proper amount of steam has been admitted on both sides of the piston to heat up the cylinder, piston, and valve, etc., to the normal temperature of the steam. The cylinder cocks are to be left open until after the engine has been started and all the water removed from the cylinder. Previous to starting the engine, all journal bearings should be properly oiled and the valve and cylinder oiler should be primed and adjusted. In case the engine has been standing idle any length of time, the interior of the cylinder, as well as the valve seat, should be examined, smoothed, and well oiled.

When there is metallic packing in piston, adjustable by springs, such packing should be adjusted in a manner to elevate the center of the piston head a very little above the center of the cylinder; the tension of springs should be very moderate; when once the packing rings fit the cylinder and the surfaces are true and smooth, a steam joint is effected; and a slight additional tension of the springs is sufficient to bear the weight of the piston and keep that packing tight for months. Tight packing not only tends to wear the parts, but robs the engine of part of its effective power. The packing in stuffing boxes, when new, ought not to be tight at first, and should only be tightened up gradually; and such steam packing joints should always be loose enough to leak a small quantity of water without any steam, insuring a constant lubrication and easy wear. Although an engineer in charge may be perfectly familiar with his plant and all its details, it is his duty before starting his fire in the morning to examine his stage of water in the boiler, and where there is an uncertainty of condition of anything, don't trust to luck. Don't load down your safety valve any more than absolutely necessary. Don't carry any more steam than required, and then at as near uniform pressure as possible. Feed the boiler uniform, and carry the water no higher than is absolutely necessary for safety. The fire in the furnace should be kept as even as possible and the charges of fuel small and often and well distributed. No holes should be allowed in the fire for the cold air to pass up through the grate, no air should be allowed to pass from the exterior to the interior of the furnace, except through its proper channel and in a proper manner. A uniform temperature and pressure of steam is very essential to the longevity of a boiler and is a good evidence of the skill of the operator or person in charge. It is also very essential that the boiler be kept clean on the outside as well as the inside; the scale on the inside is considerable of a non-conductor, and the ashes and soot on the outside of boilers and flues is still worse. The evaporating capacity of a clean boiler both in and outside is sometimes more than double that of a neglected and dirty boiler, not speaking of the greater liabilities of burning and exploding. There is no particular rule for the blowing out and cleaning of boilers, as to how often it should be done, excepting that there should be as little as possible between the fire and hot gases on the outside and the water on the inside of the heating surface, excepting the boiler plate itself. The engineer must be guided by the quality and condition of the feed water, to determine how often the boiler should be blown out and cleaned on the inside. The chimney draught, combustion of fuel, and method of firing will determine the necessity of outside cleaning.—*Frank I. Ruth, M.E., in the Stationary Engineer.*

Telephone Rates.

The oft-repeated assertion that telephonic service cannot be afforded at a lower rate than that which prevails in most of our large cities, and the oft-repeated statement, on the part of the American Bell monopolists, that "the larger the business, the larger the expense" (which is contrary to all known data of commercial science), have of late received a most convincing set-back. As everybody knows, the fundamental Bell patents have expired in Great Britain. In 1893, the same patents will expire in the United States. By reason of certain adverse judicial decisions, there exists just across the border—in Canada—a state of affairs which is plainly indicative of what will take place here in 1893. To-day Montreal furnishes the cheapest telephonic service on this continent. The long-established "Bell" company demands only $25 a year for either residential or business houses. The opposition company, the Federal Telephone Co., which brought rates to their present basis, charges $35 a year for business houses and $25 a year for residences. Both concerns are doing a lively business. The local "Bell" Co. has about 5,000 subscribers in the city, and the opposition company has about 6,500 subscribers. Both organizations use the same apparatus. This reduction in telephone rates not only applies to cities with from 5,000 to 10,000 subscribers, but is also taking place in Berlin, which has even a larger number of subscribers, and also in London, where the rates have been reduced from £15 to £10 per annum. What better evidence than these facts can be adduced to prove that the business can be done, and is being done to-day, in the largest cities of the world when the patents have become invalid through expiration of their terms, and that legislatures, in this country, will regulate the rates so as to conform to these, in some just proportion, after the patent monopoly on the Bell and Blake apparatus shall have expired?—*Practical Electricity.*

Convicts in the United States.

A census bulletin gives statistics of penitentiary convicts in each State in proportion to population. In 1880, out of a population of 50,000,000, the proportion of convicts was 709 to each 1,000,000 of population. In 1890 the proportion was 722 to the 1,000,000. The population of the United States in 1890 was 24·86 per cent greater than in 1880. In 1890 there were 27·88 per cent more convicts than in 1880. This shows that the number of convicts has increased 2·42 per cent faster in a decade than the population. Of the 45,233 convicts in penitentiaries in the United States in 1890, the whites formed 67·53 per cent, and the colored 32·47 per cent. Of the 30,546 white convicts, the native born represented 75·60 per cent, and the foreign born 23·79 per cent, while the place of birth of 0·61 per cent was unknown. The men formed 96·1 per cent and the women 3·9 per cent, showing 24·64 times as many male convicts as female.

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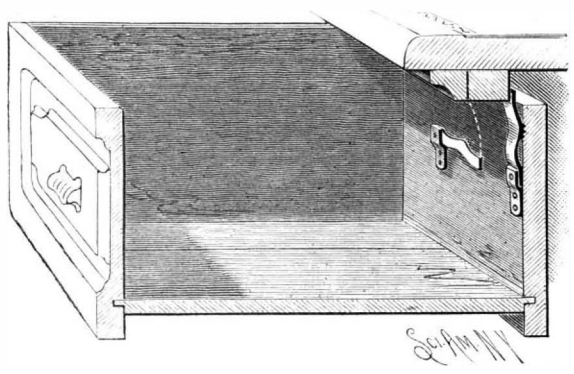
AN IMPROVED DRAWER STOP.

A simple device readily applicable to drawers of any size to prevent their being entirely withdrawn from the casing, and which may be conveniently manipulated to permit their complete withdrawal when so desired, is shown in the illustration, and has been patented by Mr. Samuel H. Levy, of No. 235 Oak Street, Chicago, Ill. The device is preferably constructed in two sec-



LEVY'S DRAWER STOP.

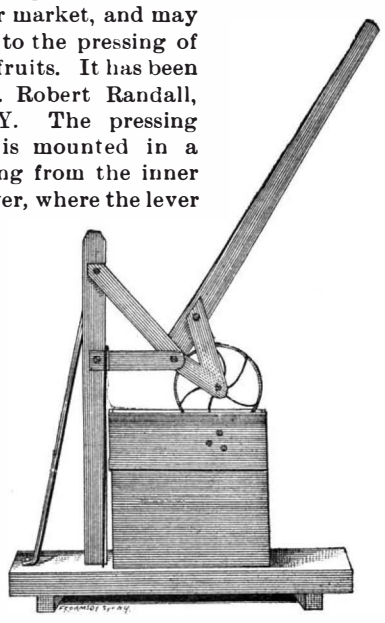
tions, one of which is in the form of a bracket to be attached to the drawer, while the other, or the stop proper, is a strip of spring metal bent in the form of a compound curve, and pivoted to the bracket, the stop thus pivoted having teeth or spurs to engage the back of the drawer. The bracket, however, may be dispensed with if desired, when the stop itself is pivoted directly to the drawer by passing a screw through the aperture in its shank end.

Tunnel Building.

The art of tunneling may be considered as having been reduced to a science, as no distance is too great and no material too hard to be penetrated if the object sought is sufficient to justify the expense. The building of the St. Clair River tunnel, where iron cylinders were forced through the clay by hydraulic pressure, was a great advance in the art of building tunnels through certain kinds of soil. The tunnel built under the streets of London, where the top of the arch is just below the cobble stone pavement, was built without in the least obstructing travel at the place where the work was being carried on. According to the *Industrial World*, a tunnel 5 miles long is now being driven through the solid rock under Gray's Peak, 60 miles west of Denver, Col. This tunnel, which is 8×18 feet, is being built primarily to tap the mineral veins in the mountains, which are thought to be quite rich. After the tunnel is complete it will be enlarged and opened for railroad traffic to accommodate an extension of the Utah Central railway, which is to form a through line from Denver to Salt Lake. Thus far about a mile of the tunnel has been driven by hand power, but a plant of ten Rand drills, with Ingersoll air compressors, has just been put in, and an electric light plant is soon to follow, after which it is expected the rate of working will be greatly increased. The excavating of this tunnel is through rock about as hard as any that can be found anywhere.

A CONVENIENT FRUIT PACKING PRESS.

The press shown herewith is designed to be operated by hand for pressing dried fruits, etc., in a case when packing them for market, and may also be adapted to the pressing of juices from fresh fruits. It has been patented by Mr. Robert Randall, of Newark, N. Y. The pressing roller or wheel is mounted in a bracket depending from the inner end of a hand lever, where the lever is also fulcrumed in a bracket upon an upright. The box or package to be filled is surmounted by a removable frame, with depending flanges holding it fairly on the box and constituting a hopper. Any ordinary platen or follower is placed on the fruit or substance in the hopper, and receives the pressure of the lever roller as the fruit is forced down. The device is constructed to weigh only about seventy pounds, so that it can be readily moved about a warehouse or other place where it is used.



RANDALL'S FRUIT PRESS.

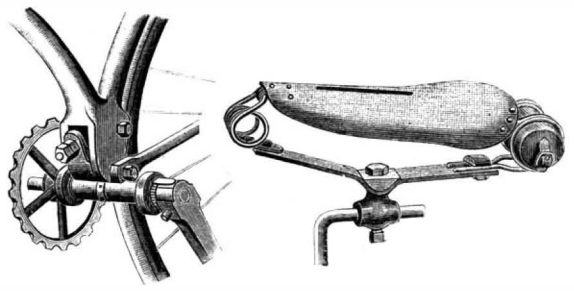
DIAMONDS IN DEMERARA.—Recent reports state that diamond mines of a richly paying character have been found in the interior of Demerara.

THE LOVELL DIAMOND SAFETY BICYCLE.

The success of this bicycle last year has led the manufacturers to make additional improvements, two of which we show in the accompanying cuts. The improved chain adjustment used on this Lovell safety is of a superior character. The bracket, which is steel drop forged, contains crank shaft and ball bearings and swings on a separate steel axle that has a long parallel bearing between a heavy forked shape section in the frame, which is brazed solidly to the frame and is a permanent fixture. The motion of the bracket is fore and aft, in the solid section of the frame, there being no lateral motion. This bracket is adjusted by a nickel rod with nut and set nut, being thus held stationary. The saddle is of the hammock suspension kind, with springs both fore and aft. A new adjustment for tipping the saddle has been added this season, which is shown in the cut. The saddle cantel has two small rivets which fit in holes in the tilting plate. By loosening the set screw, the saddle can be instantly fastened at any angle desired. The frame is diamond shape, of cold-drawn steel tubing and steel drop-forged parts. The wheels are 30 inches, with ⅞ inch crescent shaped rims. Each wheel has 40 direct spokes, of number 11 steel wire. The hubs are steel drop forged, and the wheels are designed to stand severe work on country roads. The brake is of the direct plunger pattern, and is very powerful. Ball bearings are fitted to every running part of the machine. As three-fourths of the weight of the rider comes on the rear wheel, the manufacturers have made a separate set of bearing cases,

DIAMOND SAFETY No. 1.

specially designed, bolted in the section of the frame in such manner that no matter what weight or strain is brought on the wheel it does not cramp the bearings or interfere with the ease of running. Particular attention has been given to the finish of this machine, and the enameled parts are all carefully inspected upon leaving the factory. The weight of this safety cycle



CHAIN ADJUSTMENT. ADJUSTMENT FOR TIPPING THE SADDLE.

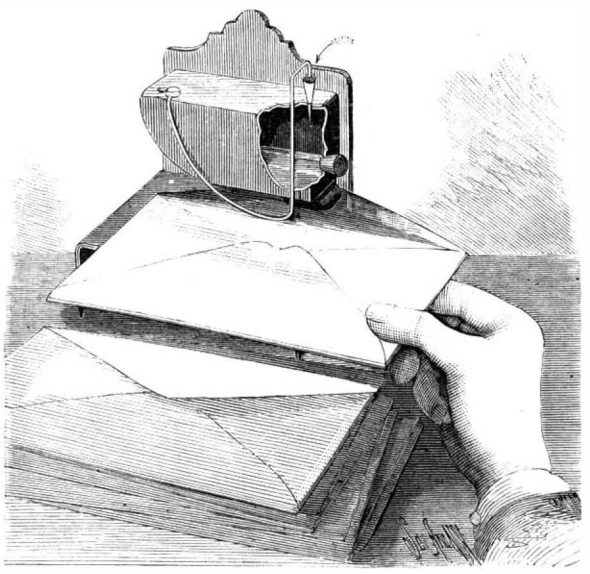
complete is 47 pounds. The manufacturers are the John P. Lovell Arms Company, 149 Washington Street, Boston, Mass., who will send illustrated catalogue on application.

Haulage of Canal Boats by Locomotives.

At a meeting of the Railway Union in Berlin, Herr Wiebe described some experiments recently made on two lengths of the Oder and Spree canal, 3½ miles long in all, with a view to ascertain the best method of towing large boats. The submerged chain system is, he states, unsatisfactory, nor has the endless rope system of traction given entirely saisfactory results when practically tested during the course of the experiments, though a great many types of supporting posts and pulleys were tried. The difficulty encountered arose from the rotation of the rope as it moved onward, which tended to twist the boat painter about the rope, and the form of connection between the rope and the painter could not be depended on to stop this action. Further experiments were then made by attaching the rope to the center of gravity of a heavy towing car, running behind and drawn by a light locomotive such as is commonly used in mines. If the rope is attached directly to the locomotive, trouble may arise from the side pull of the rope tending to overturn the engine. It is for this reason that the towing car was adopted in the experiments in question. This plan is stated to have proved satisfactory, and boats have been towed by it at the rate of 10 ft. to 12 ft. per second (7 to 8 miles per hour), though a speed of 5 ft. (3½ miles per hour) will, in general, be sufficient. The tension on the tow rope in starting three heavy coal barges was as much as 1,764 lb., but rapidly decreased as the boats gathered way.

AN ENVELOPE GUM MOISTENER.

The illustration represents a device for moistening the gum on the open flaps of envelopes and similar articles, patented by Mr. Edward E. Kingsley, of Nos. 25 and 27 Front St., Portland, Oregon. A reservoir with



KINGSLEY'S ENVELOPE MOISTENER.

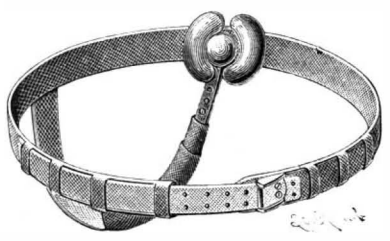
convexed under surface is attached to the vertical member of a frame whose base has pointed feet or spurs, to cause the frame to stay in the position in which it is placed. In one end of the reservoir is an opening through which the water for moistening is introduced, and in the bottom is an aperture in which a sponge or other absorbent substance is inserted, the outer end of the sponge extending slightly downward within an opening in the base member of the frame. In the top of the reservoir at one end is a small conical aperture, normally closed by a plug, attached to which is a spring arm, bent to be carried downward to the base of the frame, thence upward to movable engagement with a button or stud on the other end of the reservoir. When the gummed flap of an envelope is passed under the sponge, the spring arm is slightly lifted, thus raising the plug and allowing air to enter the reservoir, permitting water to flow through the sponge and keep it in a thoroughly moist condition. The immediate return of the plug to its position, by the spring arm, after the envelope has been passed through, prevents further flow of the moistening liquid.

Beating the Egg Tariff.

The *Tombstone Prospector* says: Since the duty on eggs has been the rule many devices have been thought of for manufacturing them. The idea of a Nogales man is, however, the only feasible scheme up to date. His proposition is to feed hens on the cheap grain of Mexico and have them lay in the United States. For this purpose a long building will be placed on the line, half in Mexico and half in the United States. They will feed and water in the Mexican end, and when they want to lay they go to the further end of the building, and in that way escape paying the duty. The projector of this enterprise came from Maine.

BROWNLOW & WARNER'S TRUSS.

In the truss shown in the illustration, a slide upon the belt carries a post which sustains a round compression pad, with an inner bearing face of cork, rubber, or other suitable material, the pad being adjustable to or from the slide. At each side of the central pad are oval side pads, attached by hinging their plate sections to the inner face of the slide at its ends, the two lateral pads being designed to compress, from both sides of the inguinal canal and rings, the tissues adjacent thereto, and to occlude the canal and rings with the natural surrounding tissues, by the combined action of these pads and the independently adjustable center pad. This improvement has been patented by Dr. John H. Brownlow and Joel S. Warner, of Ogdensburg, N. Y.



AN IMPROVED TRUSS.

THE mean of twelve determinations of the coefficient of linear expansion of vulcanite, by Dr. A. M. Mayer (*American Journal of Science*), obtained by means of a specially devised piece of apparatus, gave the value 0·0000636, between the temperature at which the experiments were made, viz., 0° and 18° C. The cubical expansion of the substance is closely represented by the formula $v_t = v_0 + 0{\cdot}000182t + 0{\cdot}00000025t^2$. The specific heat equals 0·33125. The angle of maximum polarization of a polished surface of vulcanite was found to be 57° 29′. Hence the index of refraction equals 1·568.

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RECENTLY PATENTED INVENTIONS.

Railway Appliances.

DUMPING CAR.—William F. Bennett, Peoria, Ill. This is a car of simple construction, arranged to dump either between or outside the rails, and which can be quickly removed from the rails. The car is formed in two longitudinal sections joined and having each a pivotal platform, which may be made to dump at either side by pulling out lock keys, the platforms working on axes arranged at points to one side but near their longitudinal centers. The manner in which the fastenings are arranged adapts the car to sustain any usual weight of ballast, earth, etc., and the cost of construction is but moderate.

LINK FOR CABLE GRIPS.—Vernon T. Lynch, Chicago, Ill. This link has a crosshead, on a projection from which is a right hand thread engaged by one end of a nut, the other end of the nut engaging a screw thread on a clevis, so that when the nut is turned the crosshead and clevis are moved toward or from each other. The nut is grooved longitudinally on its surface, the free end of a pawl fulcrumed on either the clevis or crosshead engaging one of the grooves to lock the nut in place. This link, which can be readily extended or shortened, is especially designed for use on cable grips.

Electrical.

INSULATOR. — George H. Graham, Ridgeland, and Thomas Gannane, Chicago, Ill. This is an insulator and support for telegraph, electric light, and other electrical conductors. It is made of glass, adapted to screw on the usual wooden pin, and has in its outer end a transverse groove for receiving the wire. The outside of the insulator also has a threaded portion to receive a threaded clamping ring. A block of insulating material is fitted in the groove over the conductor, and this block is held in place by a loop whose ends have hooks to engage the threaded ring.

INCANDESCENT LAMP COVER. — Emil T. Mueller, La Crosse, Wis. This cover consists of two similar halves, made of metal, paper, or other suitable material, and of approximately the same form as the lamp globe, there being attached to each half one end of a curved spring having a central eye for receiving the neck of the lamp. One part of the cover has a stud to be engaged by a hook on the other part when the cover is closed on the globe. The cover parts have a white inner surface, or are lined with a good reflecting material, so that when the covers are opened out opposite the neck of the lamp they will reflect the light downward.

Mechanical.

ORE CONCENTRATOR. — Gottlieb D. Husemann, St. Louis, Mo. This is an improvement in dry concentrators, in which the separation of the metal or metal bearing particles is effected by means of an air blast directed upward through a reticulated table or screen having riffles or pockets to arrest and retain the precious metal or heavier particles. As heretofore constructed, valuable dust has been liable to be lost in the use of such concentrators, and this invention provides an improvement in the pockets in the screen, and also in the bellows or blower, for the regulation of the blast.

WRENCH. — Robert Haberthur and John M. Stowell, New York City. This wrench has a jaw at the outer end of the handle member, a yoke pivoted adjacent to the jaw, and sliding in the yoke is a gripping member, with a jaw at one end and teeth on the under side of its shank, a spring-pressed dog pivoted to the body member engaging the gripping member. The construction is very simple, but few parts being used, and the wrench is capable of exceedingly quick adjustment to any size of nut, or to a pipe of any diameter it is desired to operate upon, this wrench being especially adapted for use as a pipe wrench.

THREAD CUTTER FOR BOLTS AND NUTS.—Thomas L. Lumby, Delphos, Ohio. This is a machine of simple and durable construction for cutting bolts, screws, and nuts, and adapted to cut bolts of different diameter by the same dies, the machine allowing of quickly moving the dies to engage or release the bolts after each bolt is cut, and enabling the operator to conveniently change the dies for different sized threads. The invention consists of holders fitted to slide radially in the face plate, in connection with a graduated mechanism for automatically moving the holders on the face plate to set the dies.

Miscellaneous.

SAFE OR DOOR LOCK. — William A. McCann, Jacksonville, Fla. This invention consists of a bar fitted to slide vertically and adapted to engage the locking bolt, with a spring catch engaging the bar and controlled from the combination lock. The bearings of the bar are formed on a side of a triangular steel bar secured to the inside of the door on which the lock is applied, the inner corner of the triangular bar abutting on the face of the door, so that if the latter be tampered with by the boring of burglars, the drill will break in coming in contact with the sharp corners.

TILL LOCK.—Charles T. Jearles, Binghamton, N. Y. This is a combination lock and alarm specially adapted for money drawers, locking the drawers securely and at the same time permitting their being quickly opened by one who knows the combination, then also giving an alarm, a bell ringing every time the till is pulled forward. A pivoted locking bar is adapted to pass into a transverse slot in the casing, and an arm pivoted on the table is adapted to engage an aperture in the locking bar, slotted tumblers sliding longitudinally in the casing also engaging the locking bar.

CLOCK PENDULUM ADJUSTER.—Frank M. Wakeman, Nantucket, Mass. This invention provides a simple device for automatically adjusting a clock pendulum to keep it in beat, whether the clock is inclined in one direction or the other. The improved construction provides, in combination with the escapement, pallets, and guide wire, a pivoted arm for supporting the pendulum or pallets and a weighted lever provided with a cam adapted to move the point of suspension of the pendulum or pallets.

SCALE MEASURE. — Edward T. Burrowes, Portland, Me. This is a rule capable of various adjustments, and comprising two sections, each consisting of two hinged members, the inner members of the sections lying face to face, and each having a guide loosely embracing the opposite member, the distal ends of the outer members of the two sections being disconnected and free to swing in opposite directions. This rule is designed to be specially useful in taking inside measurements, such as the width and height of the interior of window frames, while being also serviceable for all purposes for which the ordinary rule is useful.

TYPE-WRITING MACHINE. — James Richardson, North Tarrytown, N. Y. In this machine a spindle having a reciprocating rotary motion has loosely mounted on it an oscillatory type wheel, with means for disengaging the type wheel from the spindle at any time in the rotation of the latter, and re-engaging the type wheel on the return of the spindle to the point of disengagement. The movements of type, paper, etc., are effected by power called into action by but not applied through the keys, and uniformity of impression is not affected by varying pressures on the keys, while the spacing of the letters is uniform and the writer is always visible to the operator as it goes forward.

COIN-OPERATED VENDING MACHINE.—Samuel S. Allin, London, England. This machine has a series of fixed receptacles for solid or liquid refreshments, a series of coin chutes and coin-operated levers, and a central delivery mechanism common to all the receptacles, and arranged to be set to deliver different articles by the insertion of different coins. The invention is designed to improve the construction of machines of this class to render them more generally useful, and increase the number of articles which can be handled in them and the range of prices. The machine is designed to sell both hot and cold beverages, as well as simple articles of food and small wares in general use.

BRUSH HANDLE. — Charles F. Myers, McKinstry's Mills, Md. This is an improvement in adjustable handles for brushes, such as railroad brushes, shop or factory brushes, whitewash brushes, etc. Connected to the brush is a slotted ball having on its surface circular grooved seats, a screw-threaded stem being pivoted within the slot of the ball, while there is an interiorly threaded handle socket, and a grip ring is interposed between the socket and the ball, whereby the handle and brush may be adjusted to any desired angular relation to each other.

WINDOW SCREEN. — James Knowles, Jamestown, N. Y. In the construction provided for by this patent a spring roller is arranged at the bottom of the sash and a roll of netting wound around it to move in guides at the sides, the netting being attached to the lower edge of the sash, and being distended across the open space when the sash is raised, the tension of the spring roller holding the netting always taut and true.

FLOWER HOLDER. — James Martin, Temescal, Cal. This is a simple and inexpensive levice for securing flowers in place when constructing floral designs. It has a shank or pin, the upper end of which is curved to form a jaw, then laterally across the shank forming an arm, while a spring-pressed clamping jaw has an arm crossing and rocking on the shank behind the first jaw.

ICE CREAM FREEZER. — Frederic B. Cochran, New York City. This is designed to be a low cost machine in which the various kinds of ices may be frozen quickly and kept frozen a long time, while the material used in freezing will not be liable to get into the material frozen. A cylinder holding a suitable freezing compound is adapted to be rotated just above and partially projecting into a cream pan, which is adjustable in relation to the cylinder, a thick coating of the cream or other material being frozen upon the cylinder as the latter is revolved.

FOLDING CRATE. — Job Spain, Belle Center, Ohio. This is a crate in which fowls may be kept and transported alive, and is designed to be light and airy while strong and durable, and to be folded when empty into a very small compass for convenience in transportation. The floor of the crate has sills on opposite sides to which are pivoted rods shaped to form the sides and top, corner plates being mounted on the upper portions of the rods, while a suitable end board and door are secured to the end rods and floor.

SPRING BUCKLE. — Charles B. Underhill, Lancaster, N. Y. This buckle has two shanks semicircular in cross section lapping each other with their flat faces and surrounded by a coiled spring, forming a device particularly applicable to trunk straps, horse girths, and other straps having attached buckles, admitting of the strap being more easily and closely buckled. Used in connection with a horse girth, the device is designed to make the girth more elastic than usual, and obviate trouble from the stretching of the girth.

BRAKE SHOE. — John J. Davenport, Philadelphia, Pa. This is an improvement in brake shoes, so made that the wearing block may be readily removed and another one substituted. The brake block holder has a top and bottom and one perpendicular side face projecting to form three sides of the block socket, the side face having spurs, and there being also spurs on a removable section, fitting and being held by screws in a rabbet of the holder.

CIGAR CASE. — Jacob H. Fawkes, Chicago, Ill. This is a collapsible case, designed when empty to lie as flat as an ordinary leather case, but having side frames with pivoted edge connections, and end pieces hinged to the frames, adapted for ready adjustment in such a way that cigars held in the case will be protected from being crushed or otherwise broken.

TOBACCO KNIFE. — Peter J. Bernard, Union Hall, Va. This is a tool designed more especially for harvesting plants, and also adapted for cutting and pruning other vegetable growths. The handle has a forefinger receiving opening, and is re-enforced at this point by the blade tang, the tool being adapted for convenient use for a long time without cramping or disabling the hand.

FILTER APPLIANCE. — Charles G. Purdy, Brooklyn, N. Y. This is an antiseptic air vent and overflow device designed to give free vent of filtered fluid while excluding injurious germs, and allowing free outflow of surplus filtered fluid without admitting impure atmospheric air. A tubular body having at its outer part an air sterilizing substance is fitted to the reservoir, an overflow pipe with a fluid seal trap is connected to the tubular body, and a drain pipe is connected to the outer end of the trap, whereby impurities are positively excluded from the filtered fluid reservoir.

NOTE.—Copies of any of the above patents will be furnished by Munn & Co., for 25 cents each. Please send name of the patentee, title of invention, and date of this paper.

NEW BOOKS AND PUBLICATIONS.

PALMER'S NEW PRONOUNCING POCKET DICTIONARY OF MUSICAL TERMS. By H. R. Palmer, Mus. Doctor. H. R. Palmer, New York, N. Y. Pp. 62. Price 25 cents.

THE STEAM ENGINE. By Daniel Kinnear Clark. Blackie & Son, London, Glasgow, etc., and New York. Parts 3 and 4. Pp. 255, 257 to 512. Price $1 a part.

We note the reception of parts three and four of this very elegant publication. The record of systematic trials of furnaces and boilers, including many typical steam generators, is contained in part three. These include evaporative tests of the same with steam stokers, powdered fuel and other variations on ordinary practice. Part four gives rules and tables for the work of steam in engines, analysis of its action when expanding into a cylinder, the operation of compound engines and the like. Each part contains one or two large folding plates illustrating engines of different kinds. The work is unexceptionable in appearance and general make-up.

THE PHYSICIAN'S VISITING LIST FOR 1891. Fourteenth year of its publication. Philadelphia: P. Blakiston, Son & Co.

POWER THROUGH REPOSE. By Annie Payson Call. Boston: Roberts Brothers. 1891. Pp. 169. Price $1.

This work is a plea for the gospel of relaxation. It is very timely at this day, when so many men and women insist on living on their nerves.

SCIENTIFIC AMERICAN BUILDING EDITION.

APRIL NUMBER.—(No. 66.)

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1. Plate in colors showing a cottage on Lombard Avenue, Chicago. Two floor plans, perspective elevation, etc. Estimated cost $2,800.
2. Colored plate of an attractive residence erected at Bridgeport, Conn. Cost $6,900 complete. Floor plans and two additional photographic elevations.
3. A cottage costing $2,700 complete, erected for Mr. R. H. Keller, at Rutherford, N. J. Three elevations and plans. Mr. U. D. Peck, architect, Rutherford, N. J.
4. Photographic view and two floor plans of a cottage at Austin, Chicago. Estimated cost $3,300.
5. A row of new dwellings on West 82d Street, New York. Cost of each house $20,000 complete. Messrs. Berg & Clark, New York, architects.
6. Cottage recently erected at New Haven, Conn. Cost $6,850 complete. Floor plans and photographic perspective elevation.
7. An attractive dwelling erected at Yonkers, New York, at a cost of $6,000. Photographic elevation and floor plans.
8. Two photographic views of the beautiful residence of Mr. Noakes, on Riverside Park, New York City, a colored view of which appeared in the March issue.
9. Sketch of a sixteen story office building to be erected at Chicago. Cost $750.000.
10. Sketch of a water-cooled building. One of the novelties proposed and patented for the World's Fair at Chicago.
11. Recently erected English houses. Plans and perspective views.
12. Miscellaneous contents: How to catch contracts.—Toggle bolt for electrical and other fixtures, illustrated.—Composition for retarding the setting of plaster.—Quarrying marble.—The education of customers.—Iron and steel for building purposes.—An improved sanitary earth closet, illustrated.—Stamped metal ceilings, illustrated.—The Plaxton hot water heater, illustrated.—A hot water heater for soft coal, illustrated.—An improved woodworking machine, illustrated.—An improved casing for steam pipes, illustrated.

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Presses & Dies. Ferracute Mach. Co., Bridgeton, N. J.

Barrel, Keg, and Hogshead Machinery. See adv. p. 189.

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Notes & Queries

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information and not for publication.
References to former articles or answers should give date of paper and page or number of question.
Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all either by letter or in this department, each must take his turn.
Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.
Scientific American Supplements referred to may be had at the office. Price 10 cents each.
Books referred to promptly supplied on receipt of price.
Minerals sent for examination should be distinctly marked or labeled.

(2944) M. B. writes: I have a valuable meerschaum pipe, which has got very strong, and I would feel extremely obliged to you, if you would publish in Notes and Queries the best way to cleanse the same. A. Close the hole in the stem with a cork. Pour alcohol in the bowl, and remove excess with sponge or blotting paper. Be careful to let none run down the outside, as it will cause a white mark. Then set it on fire. If it seems to get too hot, blow it out or extinguish by corking the bowl.

(2945) Chemist asks for method of manufacture of soluble glass by the wet method, proportion of sand to caustic soda, and is there a process for making same out of infusorial earth? A. It is sometimes made by heating caustic soda solution and flint together in digesters under pressure. We recommend our SUPPLEMENT, No. 317, for a paper on the subject.

(2446) T. H. De S. asks: Specific gravity of ash being 0·845, what will be the weight of a cubic foot if it be under water, and the rule for it? A. The weight of a cubic foot of water may be taken as 62½ pounds. The cubic foot of ash will weigh 0·845×62½=52·8 pounds. It will be buoyed up in water by an effective force equal to 62·5—52·8=9·7 pounds. The rule is based on the fact that a body immersed in water is buoyed up by the weight of water displaced and is attracted downward by gravity.

(2947) A. E. S. asks: Would it be best to mix the acid sulphite, alum and hypo soda fixing bath for negatives recommended by Cramer with a plain bath, after it becomes weakened from use, and precipitate both with sulphuret of potass., or would it be best to precipitate each separately? A. Mix an entire new bath and throw down the silver in the old mixed bath with sulphuret of potash.

(2948) G. E. L. asks how to redevelop a daguerreotype. It has faded so it can hardly be seen. A. It may be brightened by having a very weak solution of cyanide of potassium flowed over it. Great care is necessary; we advise you to put it in the hands of an experienced photographer.

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(2949) G. P. asks: Can you please tell me how to mend hole in rubber foot ball? A. See answer to query No. 2903. To resist the pressure, the patch should be inside. Success is doubtful.

(2950) G. H. R. asks: 1. Will you please give the chemical reactions in the development and fixing of a dry plate with pyro developer? A. The developer reduces to a metallic state the bromide of silver in the film which has been acted upon by light. The fixing bath dissolves out the bromide of silver unacted upon either by light or the developer. 2. What will remove pyro stains from the fingers? A. A solution of citric acid—20 grains to one ounce of water will remove the stains. 3. What is process of manufacture of celluloid? A. 100 parts camphor are mixed with 42 to 50 parts pyroxyline (nitro-cellulose) and pressed or rolled hot. Another method dissolves 50 parts nitro-celluiose in 100 parts alcohol with 25 parts camphor and evaporates to the consistency of jelly. By exposure to the air in thin plates it hardens.

(2951) W. L. R. asks: 1. What preparation or solution can I use to make a pair of buckskin moccasins waterproof? A. Use grease or leather stuffing. It will change the nature of your buckskin. 2. I put a Cramer plate in a solution of alum and water to take out the frills. The frills came out, but on drying the plate, it left the alum on it. I washed it in running water for hours, but it would not come off. What will take it off without injury to the plate? A. The particles of alum may be rubbed off with a tuft of wet absorbent cotton. If they are firmly fixed in the film, there is no easy way to remove. Possibly by soaking the negative in a weak solution of water and sulphuric acid, the deposit may be dissolved out. 3. A recipe for making magnesium cartridges to be operated by a fuse like the Scoville magnesium cartridges? A. An effective magnesium compound is made by mixing equal parts of nitrate of barium and magnesium powder. Put it in a paper case and connect with a slow powder fuse, which can be had from manufacturers of powder.

(2952) S. H. H., Jr., says: I wish to make a small camera for taking photographs four inches high, three wide and about two deep. Would you please tell me the size and kind of lens to use in making a camera of the above size? A. You need to use a two inch equivalent focus, Morrison or Gray wide angle lens. The diameter of the lens would be about half an inch. 2. How can I secure a light background in taking photographs? A. A common plain blanket hung up behind the object will give you a light background, or use very large sheets of manila paper.

(2953) A. C. S. asks: How can tallow be softened or refined so that it may be used as a lubricant for the working parts of a microscope? The opticians use the material, which is admirably adapted to the purpose, but I have been unable to learn how it is treated, but after treatment the tallow is almost as soft as lard. A. Tallow can be softened by mixture with oleic acid or with some neutral oil such as sweet almond oil. Treatment with borax and water hot is good as a refining process.

(2954) P. C. asks: 1. How can I find the weight of a casting of common gray iron? I have the full size pattern of soft pine at hand. A. Multiply weight of pattern by 14. 2. In an electro-motor of any given size, what increases the efficiency—more winding on the field magnets or more divisions on the armature? A. It is good practice to use plenty of divisions on the armature. Its winding must be based on the difference of potential between its terminals and the desired power. 3. Are not all electro-motors series wound? A. No. They are often shunt and compound wound. 4. How would lengthening or shortening armatures (of motors) of the same number of coils and same diameter of core affect the efficiency of the motor? A. No direct effect can be predicated. In a general sense the armature core should be of rather large diameter. 5. In four field magnets faced and bolted together would the lines of magnetic force be perfect, so as to give twice the pull on the armature that one pair of magnets would give? A. A single large electro-magnet is far more advantageous than a combination of small ones.

(2955) J. J. asks for a filling, black and other colors, such as is used for brass signs, something that will harden and stand exposure to sun and weather, also the cleaning of the brass with acids and by rubbing. A. Melt together in a clean iron pot two parts each of best asphaltum and gutta percha, stir well together, then add one part of powdered gum shellac. It should be used hot. It may be mixed with smalt, vermilion or other pigment if desired.

(2956) L. M.—If you use well insulated wire and wind carefully, you may omit the shellac varnish altogether, or you may soak the coil in very thin varnish after it is completed, allowing it several days in which to dry.

(2957) W. W. D. asks if double or single cotton-covered wire is used to wind 8 light dynamo, also if the two rods down side are of brass or copper. A. Double-covered wire is preferable wherever it can be used. The rods are of copper.

(2958) A. B. T. asks what will stick the amber mouth piece of a pipe together; it is broken about ⅛ inch from the end. I have tried many kinds of glue, but cannot stick it; the heat or moisture of the mouth seems to soften the glue. A. Moisten with linseed oil and press together after heating. Too much heat will ruin the amber, and too little will not cause adhesion.

TO INVENTORS.

An experience of forty years, and the preparation of more than one hundred thousand applications for patents at home and abroad, enable us to understand the laws and practice on both continents, and to possess unequaled facilities for procuring patents everywhere. A synopsis of the patent laws of the United States and all foreign countries may be had on application, and persons contemplating the securing of patents, either at home or abroad, are invited to write to this office for prices, which are low, in accordance with the times and our extensive facilities for conducting the business. Address MUNN & CO., office SCIENTIFIC AMERICAN, 361 Broadway, New York.

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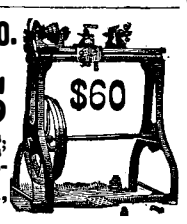

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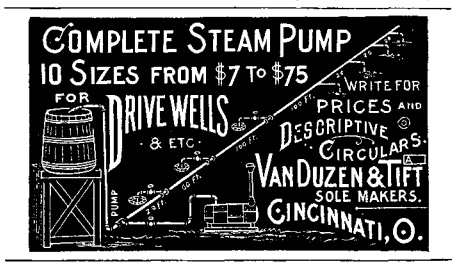
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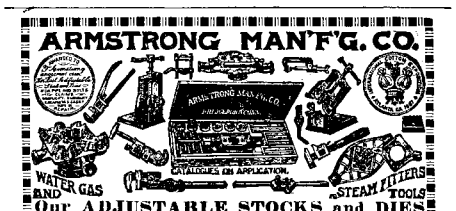

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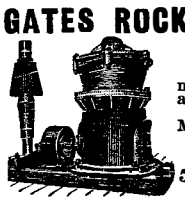

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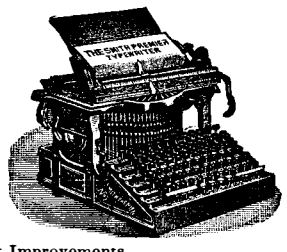

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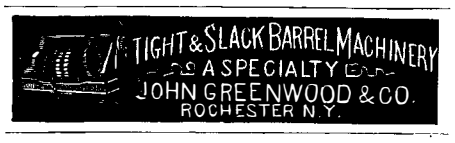

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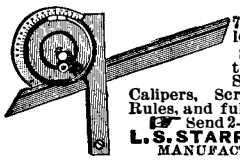

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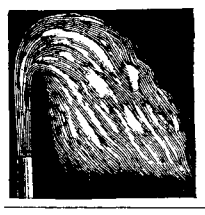

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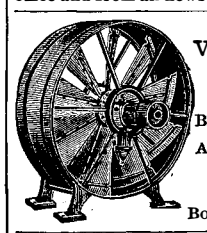

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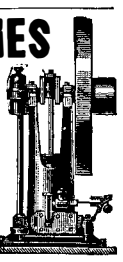

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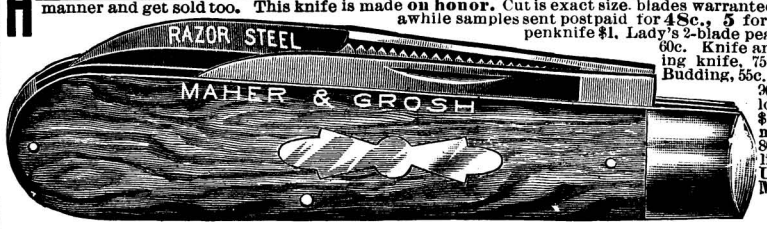

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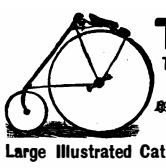

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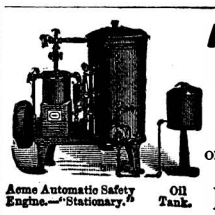

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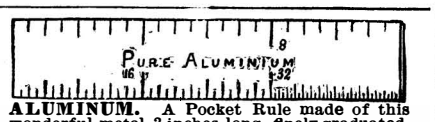

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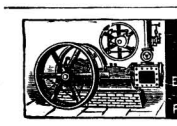

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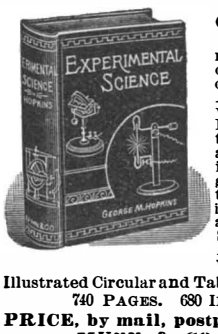

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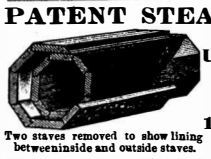

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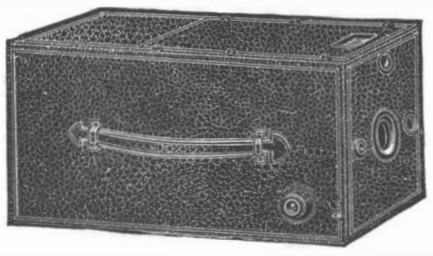

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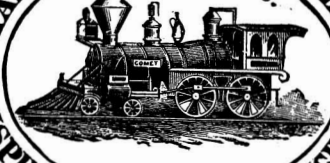

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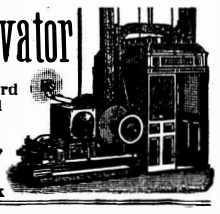

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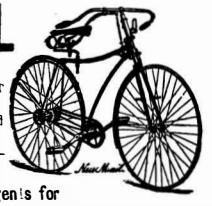

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